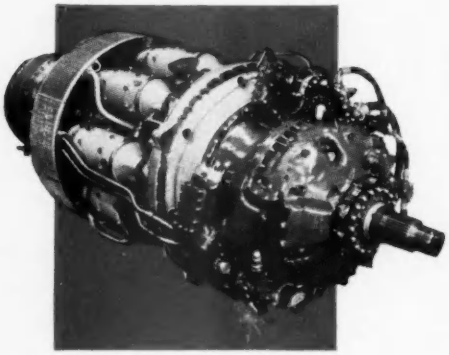
ELECTRICAL TIMES

THURSDAY
10 JULY
1952
NINEPENCE



Built by the Bristol Aeroplane Company for the B.O.A.C. the *Britannia* will be used to operate fast services on main airways with maximum economy. The four Bristol *Proteus* 705 propeller-turbine engines installed in each of these superb air-conditioned aircraft will give cruising speeds of about 370 m.p.h. at 35,000 ft.

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What does POWER FACTOR mean to you?

COS ϕ OR TAN δ

If your answer is Cos ϕ we may be forgiven for assuming that you are an electric power engineer, spending most of your time trying to get as much out of a circuit as goes into it. We all know that under ideal conditions Cos ϕ closes on unity, but in inductive circuits amps impishly lag behind volts ; result—loss of power.

Perhaps you are an insulation engineer, in which case Tan δ is one of your more immediate preoccupations. You are concerned with losses in di-electrics and your constant endeavour is to produce a current leading 90 degrees, which under ideal conditions means that Tan δ must equal zero. Your work tends to be frustrated because no material has yet been developed which makes this possible, but several grades of Delaron Laminated Plastic get pretty close with a loss angle of less than 1 degree.

May we send you full details and test figures covering the entire range?

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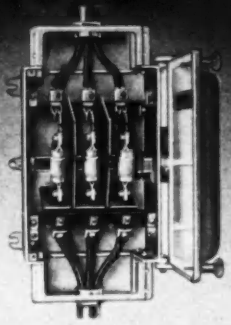

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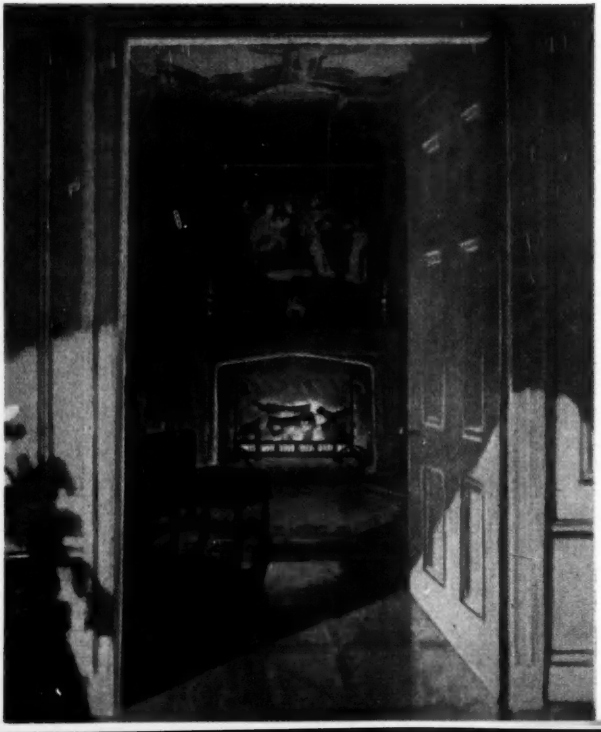
The Human Element

A great deal of patient research has been carried out in laboratory tests, which, we are told, prove the superiority of solid fuel for domestic heating. There would appear to be nothing more to be said . . . But there is. A great deal more. This alarmingly simple conclusion is based on the fallacy, now tediously familiar to most of us, that the performance of certain materials in a laboratory can be directly and immediately related to the habits of men and women in their own homes. We have been presented with an equation of painstaking accuracy, from which one vital factor — the human element — has been entirely omitted.

What are the true facts? One is that very few families run to planners' rules. Their heating needs vary with their preference for television or bridge, carpentry or dancing, with the number of their children and the circle of their friends. Another fact — of tremendous practical importance — is that the vast majority of houses have ordinary open grates, burning with extreme inefficiency 38 million tons of coal in a year against the 4 million needed for the electric heating load. Assuming, however, that each one of these grates could immediately be replaced by one of the latest controlled-draught patterns, could any legitimate advantage be claimed for them over the electric fire? None whatever. For periods up to six hours — the average length of time a family spends round the fire in winter — less coal is needed to heat a room by electricity than by the most efficient open grate.



As the weather grows warmer and the heating periods shorter, the comparative efficiency of the electric fire becomes more and more marked.

For most of the day, for most of the year, for most of the people — the advantages of a Magicoal Fire are overwhelming.

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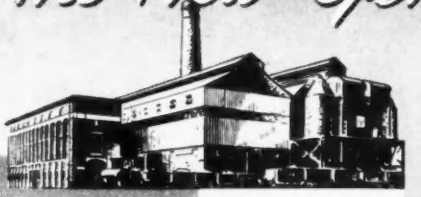
The New Generation at NORTH TEES



North Tees "A" Power Station

1917 BABCOCK 1952

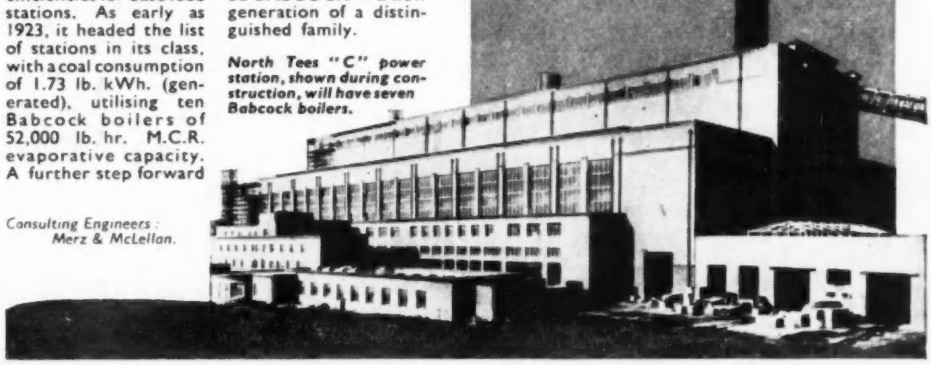
The original North Tees power station, commenced in 1917, was the first in Great Britain with high pressure boilers and represented the latest in power station practice.

With steam at 475 lb. sq. in. and 700 F, the introduction of reheat, and three stage bled steam feed heating, it marked a very big advance in the quest towards higher thermal efficiencies for base load stations. As early as 1923, it headed the list of stations in its class, with a coal consumption of 1.73 lb. kWh. (generated), utilising ten Babcock boilers of 52,000 lb. hr. M.C.R. evaporative capacity. A further step forward was made in 1925 when the "B" station opened, with eight Babcock boilers of 94,000 lb. hr., which were followed by two more of 180,000 lb. hr. in 1942.

Now, a new station is arising at North Tees. Its capacity will be 240 MW against the original 40 MW. Its steam conditions are 950 lb. sq. in. and 940 F. But the boilers, now each of 360,000 lb. hr. capacity, will still be BABCOCK — a new generation of a distinguished family.

North Tees "C" power station, shown during construction, will have seven Babcock boilers.

Consulting Engineers: Merz & McLellan.



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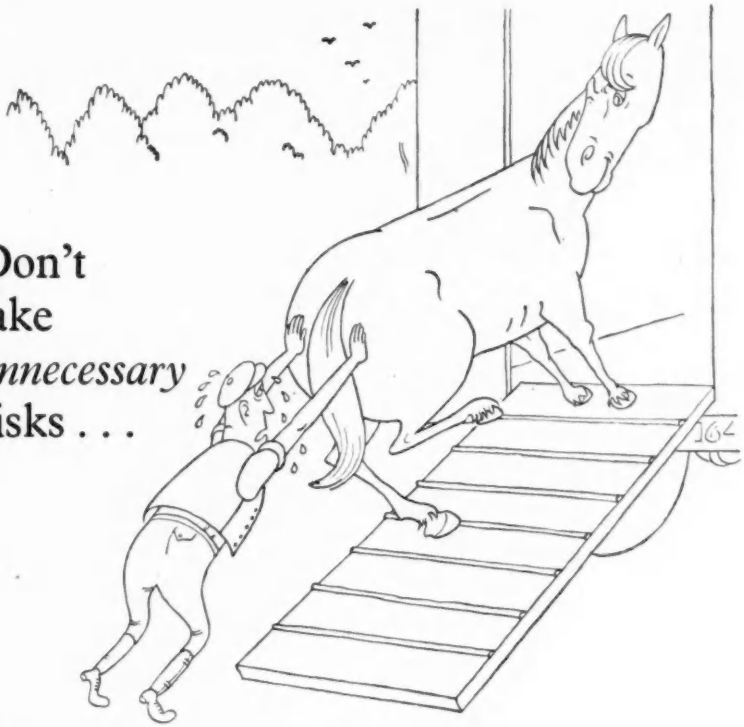

WE *do* get a kick out of taking unnecessary risks . . . but is it worth it? Wouldn't it be *so* much better if we gave it a little more thought in the first place? So often it's too late to do anything about it — the risk is taken, the damage is done — and there we are, all up in the air and wondering what to do next. It's no consolation to know that everybody's doing it — someone or other somewhere or other is taking needless risks every day, every month, every season; and speaking of seasons, let's talk about a very superior Spring . . .

WARNING TO MANUFACTURERS: You take unnecessary risks whenever you buy 'cheap' springs of uncertain quality; low initial outlay will never balance the ultimate harm they may do to your product, your prestige and your purse. When you specify "Springs by Salter" you're certain of getting top-flight quality — quality that cuts out risk and guarantees years of highly-efficient, dependable service. Only the best — of materials and workmanship — is good enough for SALTER.

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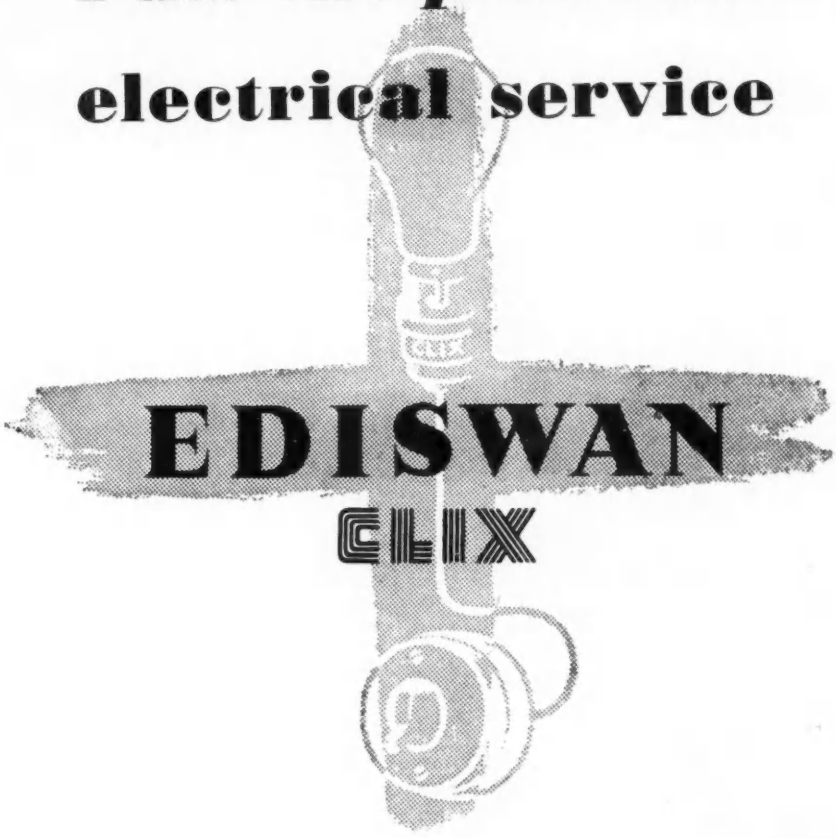

An event of paramount importance to all concerned with electrical installation is the taking over by The Edison Swan Electric Co. Ltd. of Clix and Genacco electrical accessories. Everything required for a highly efficient service—lamps, lighting fittings, cables and accessories—can now be supplied by The Edison Swan Electric Co. Ltd. Bear this in mind when planning new installations or modernising existing ones.

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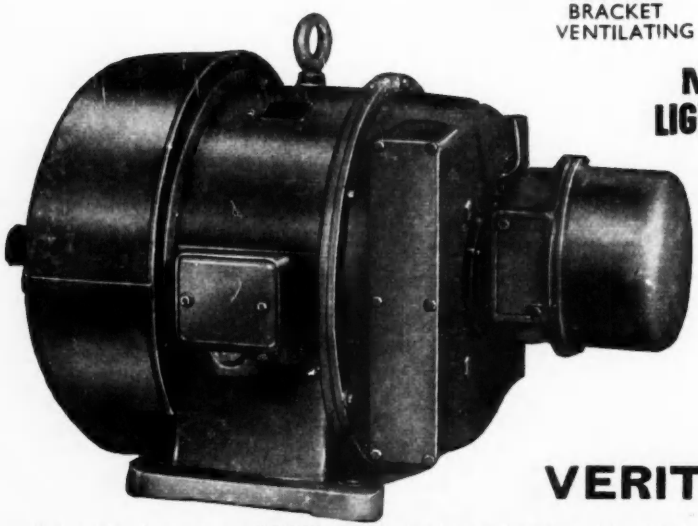

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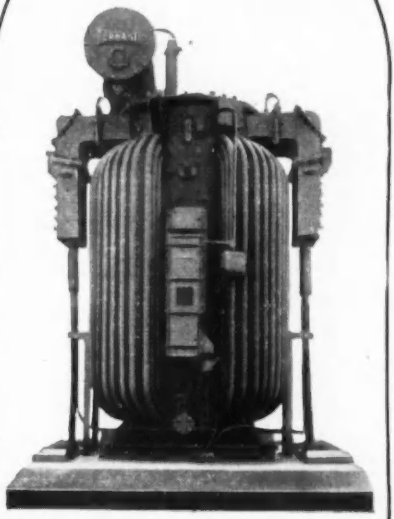

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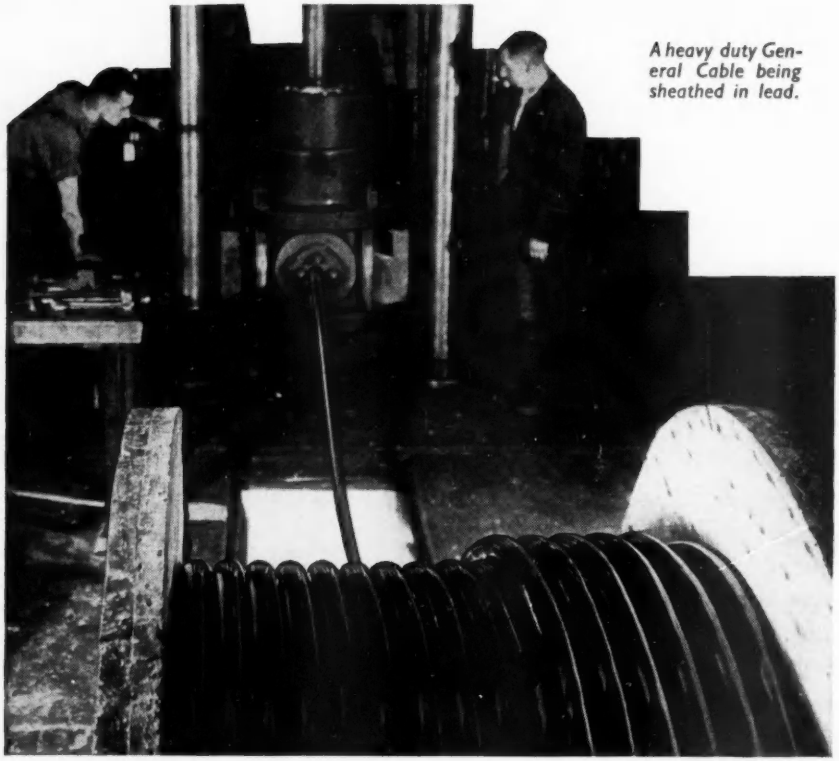

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the length of
a long or
the height of
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questions like
what's the
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will never find
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you try and
you try but

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defeat us for
measuring that is
a matter of meters and

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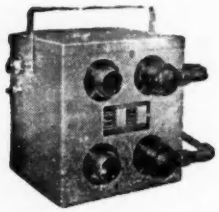

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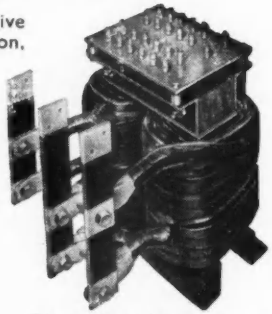

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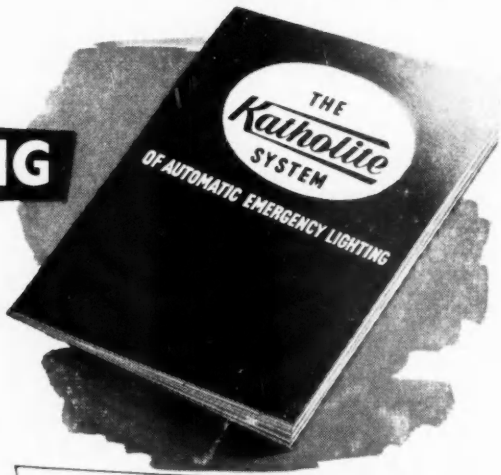

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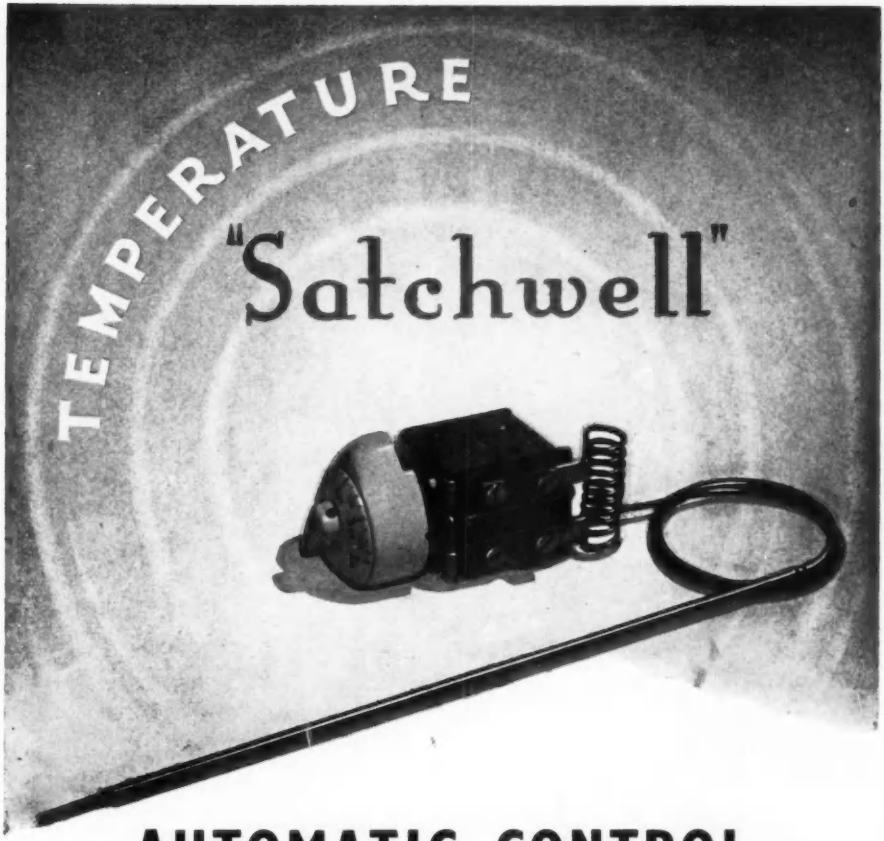

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This picture shows one of a range of hydraulically operated electric cooker oven thermostats, type "HCS", which we have developed.

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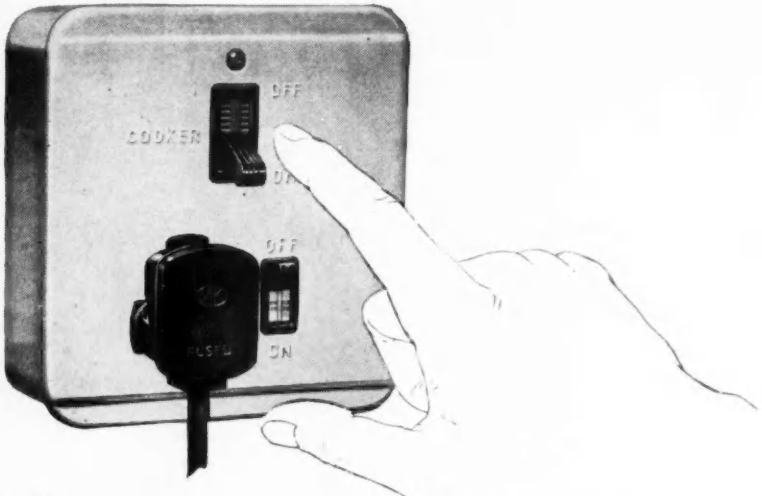

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Illustration is List No. 5080/646 surface cooker control unit

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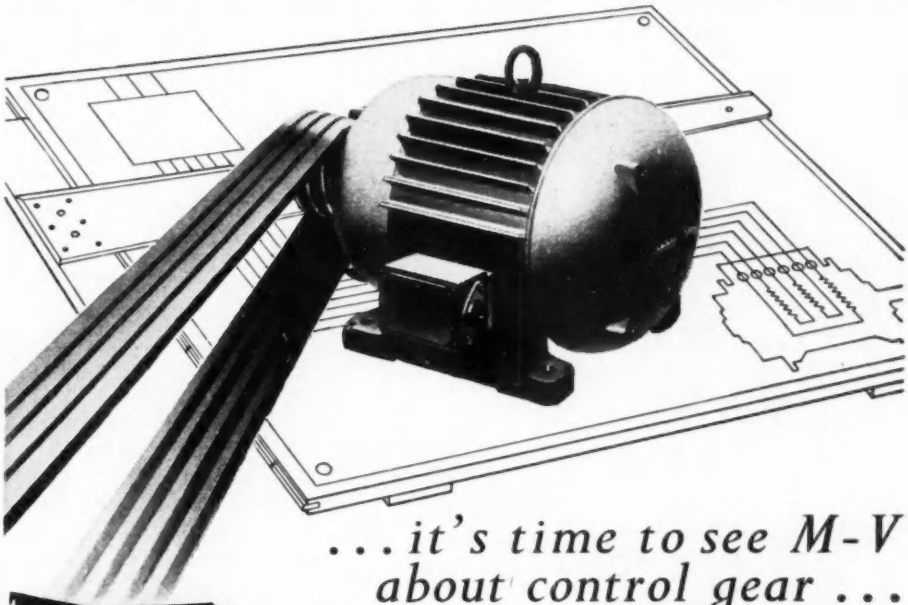

... it's time to see M-V about control gear ...

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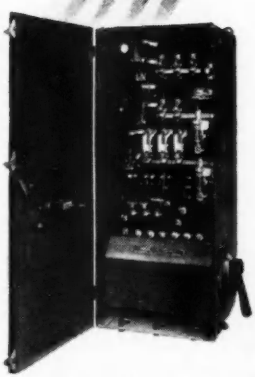
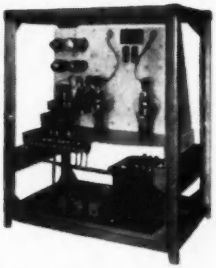


M-V Stator-rotor Contactor Starter



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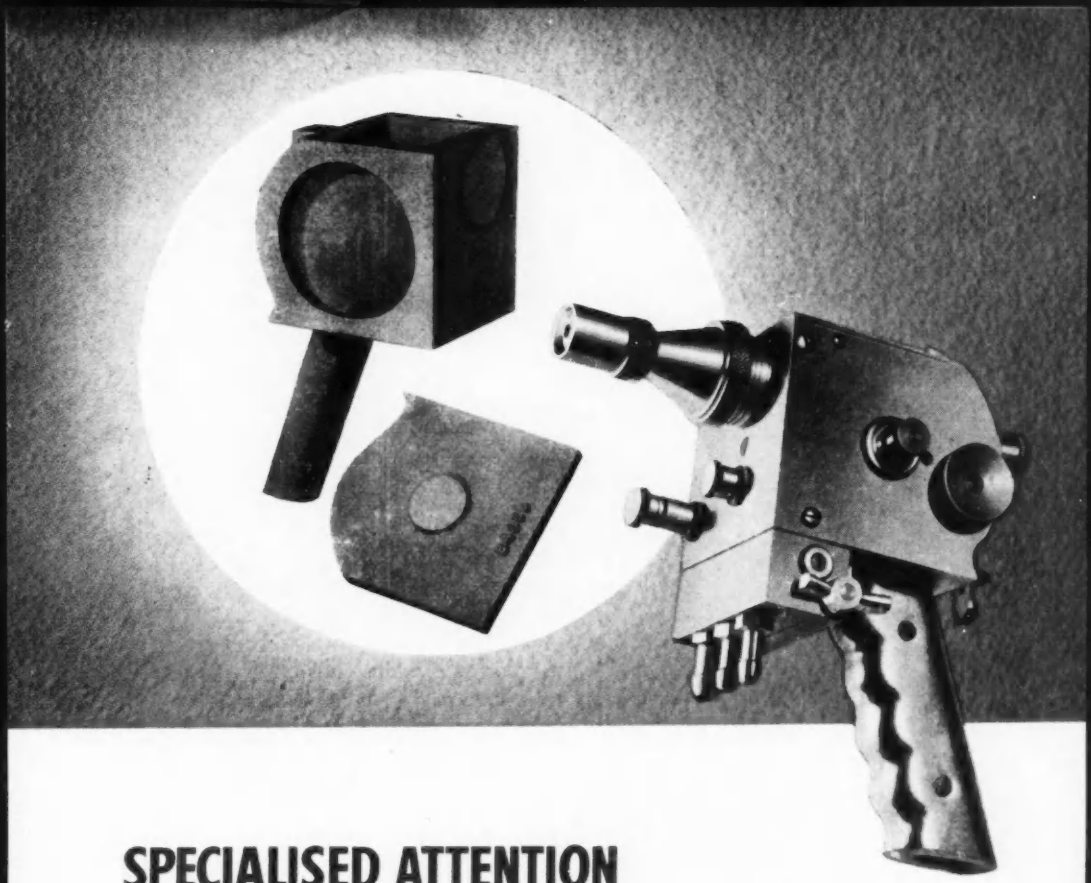

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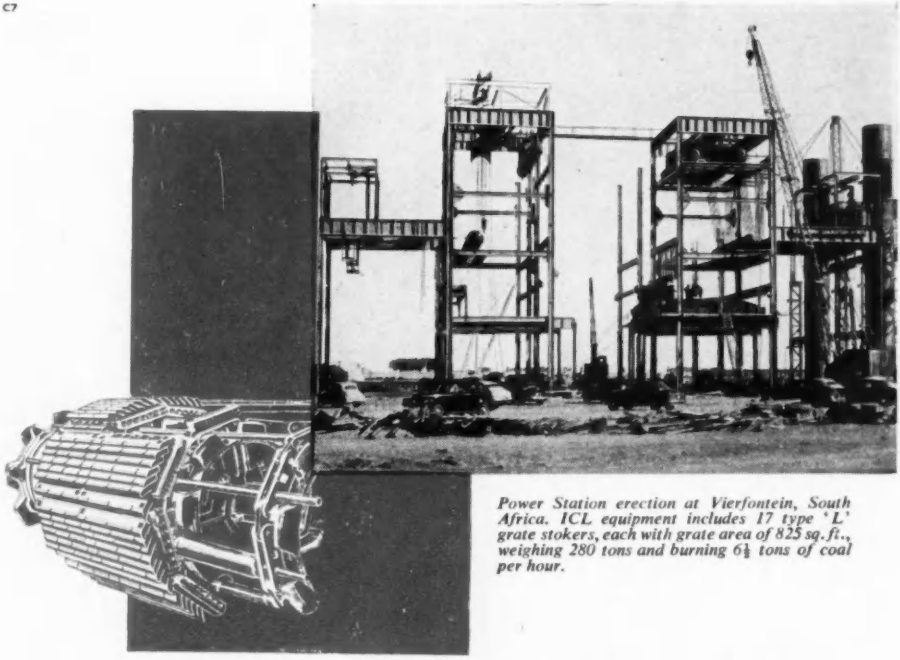

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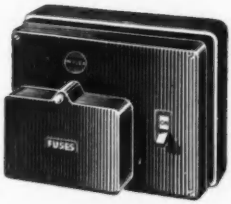

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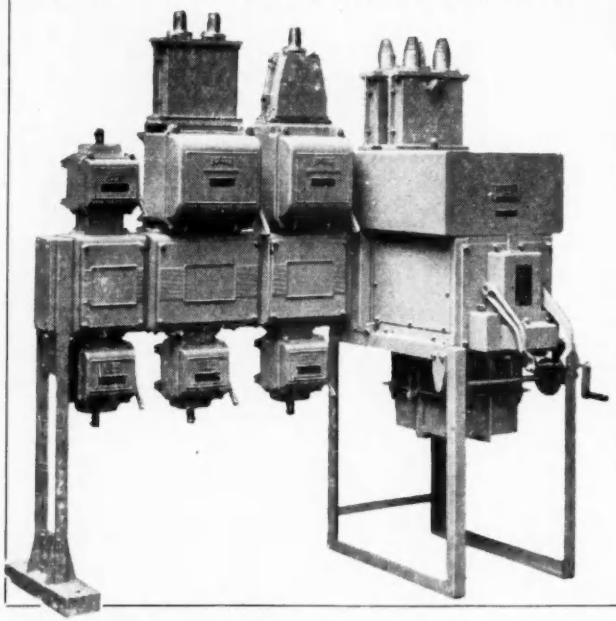

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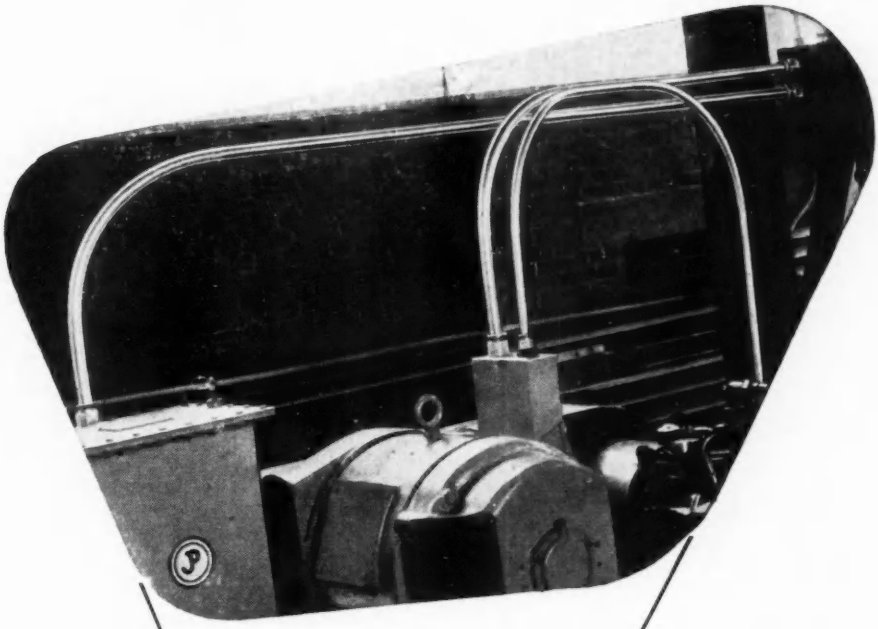

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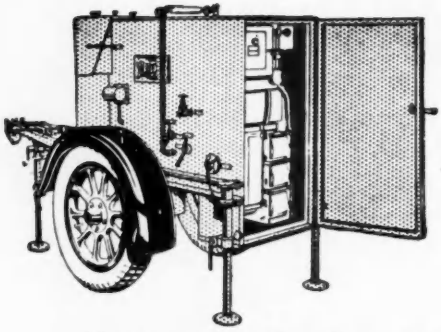
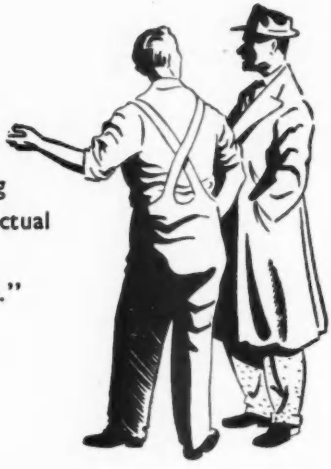


EFFICIENCY AND ECONOMY



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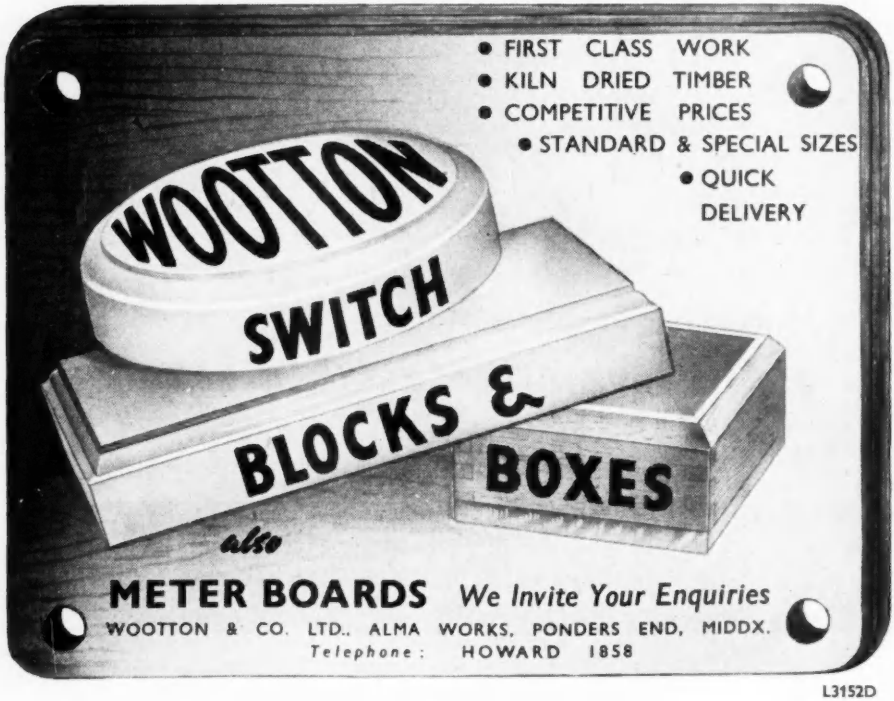

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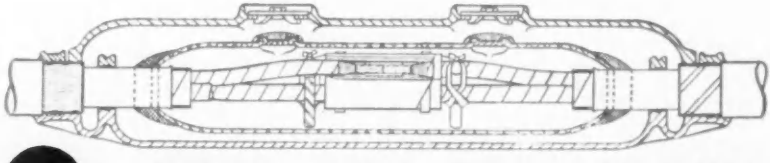

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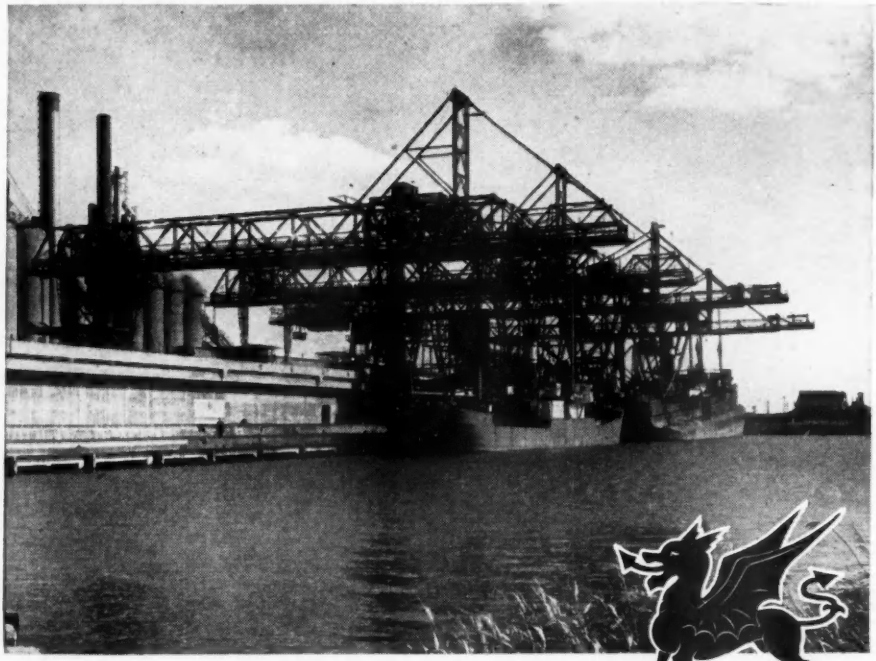

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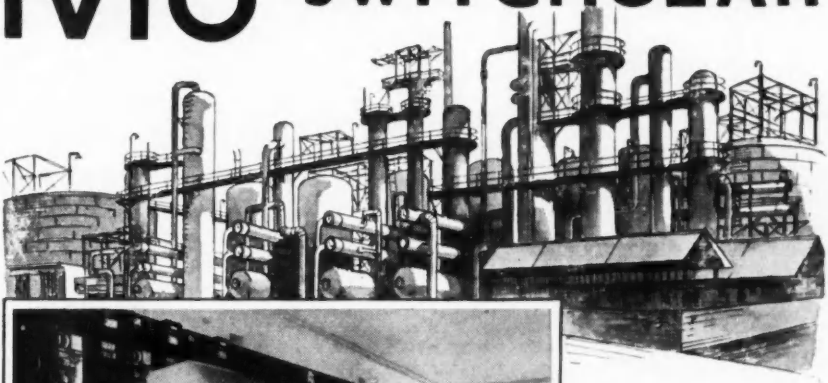
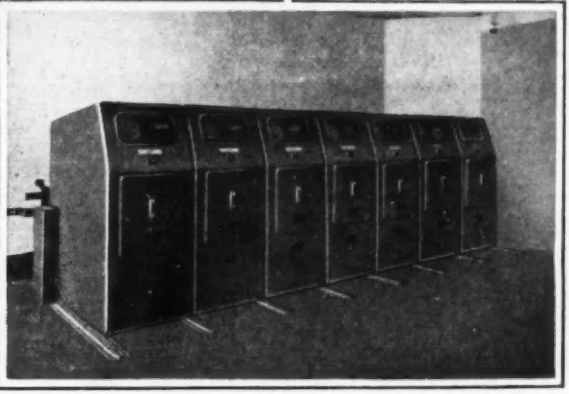


6.6 kV, 150 MVA SWITCHBOARD INCORPORATING REMOTE AND LOCALLY CONTROLLED SOLENOID AND SPRING CLOSED OIL IMMERSED METALCLAD UNITS.

PICTURE ON LEFT ILLUSTRATES A NUMBER OF THE UNITS ISOLATED.

PICTURE ON RIGHT ILLUSTRATES A HAND OPERATED, 415 VOLT, 3-PHASE, 4-WIRE, 25 MVA METALCLAD SWITCHBOARD.

(With acknowledgment to Shell Refining & Marketing Company Limited).



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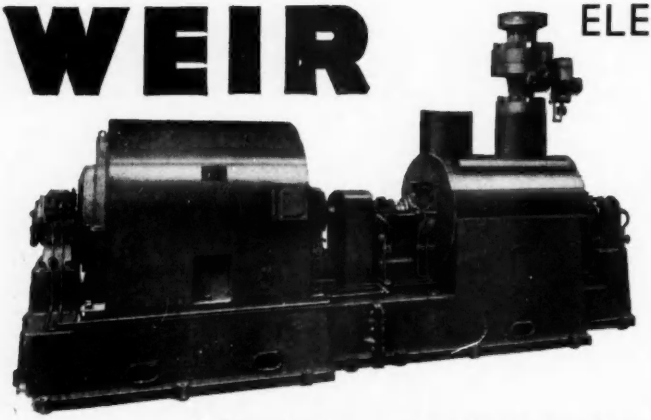

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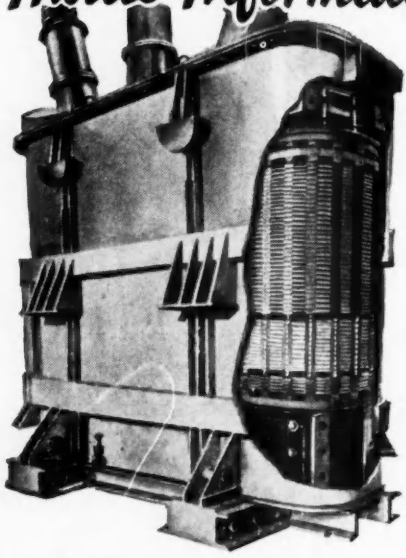
Inside Information on Transformers



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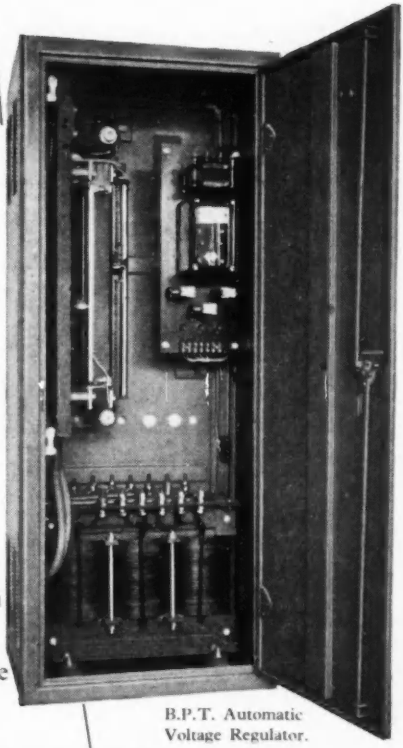

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ELECTRICAL TIMES

Vol. 122 No. 3166 THURSDAY, 10 JULY, 1952

PUBLISHED EVERY THURSDAY

SIXTY-FIRST YEAR OF PUBLICATION

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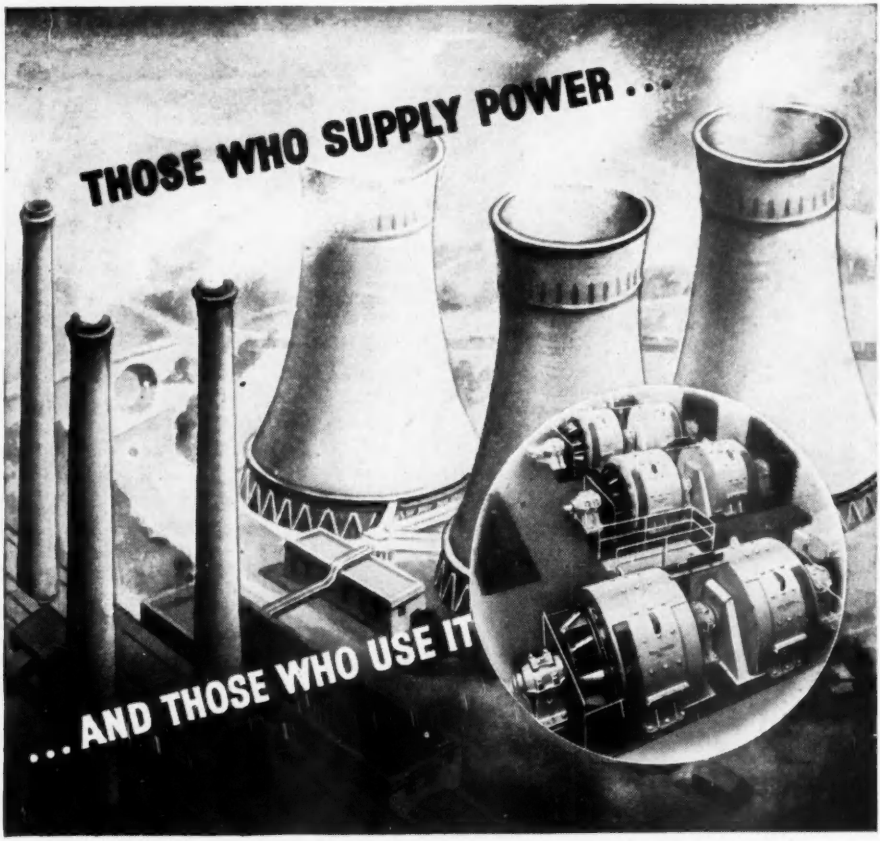

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Editorial

CHANNEL CROSSING

THE announcement by the Minister of Fuel in the Commons on Monday, concerning the report of the Anglo-French committee on the electrical linking of the two countries showed that agreement has been reached on economic and technical questions, but he specifically reserved consideration by the Government on political grounds. As indicated in the article on page 76 of this issue, it seems reasonably certain that in three or four years time there will be periodic interchanges of 100 MW between the two countries, according to the respective non-coincident peaks. The choice of 132 kV places the technical responsibility on the cable makers and avoids the more experimental nature of a direct current scheme. It will be recalled that at the last CIGRE meeting, submarine transmission was discussed at some length, particularly the relative merits of 3-core and four single core cables, one being a spare. Since single-core cables can be manufactured in greater lengths, with consequent fewer joints, it would seem likely that the latter system will be adopted despite the higher transmission losses. Although the capital cost of the scheme is considerable, because it is to be shared, both countries will obtain the equivalent of 100 MW of plant at a cost of about £25 per kW, certainly an economical figure.

PRESSURE FOR FIRES

GOVERNMENT and Opposition could find little substance for contention in Monday's House of Commons debate on fuel and power. Greater exports of coal are desired; closer attention to efficient use is necessary. These old themes were duly emphasised by the front benches, but there was one significant change in the supporting speeches. The use of electricity for heating was strongly and positively advocated. Sir Arnold Gridley, in a statement that must have sounded heretical to many in the House, argued his case for electrical methods of heating and cooking in the home with reference to the prevailing low rate of load growth and to the facts of electricity supply economics. Such a voicing of electricity's counter-attack in the Commons is an important new development in the campaign in which this journal has played its part against badly-informed vilification. It is to be hoped, now that pressure on the Minister has been built up at all levels, it will be maintained, until practical recognition of some of the industry's more serious grievances is forthcoming. It is clear from the tenor of his speech that Sir Arnold Gridley will be playing an important part in this sustained effort.

KEEP B.S.I. INDEPENDENT

IN general, the report of the Monopolies Commission on electric cables, with which we dealt last week, confines itself to commercial matters. The Commission is gracious enough to admit explicitly its lack of competence to discuss engineering. In spite of this, there is one excursion into technology in the report, with reference to the standardisation of cables as regards quality of dielectric. This item might pass without comment, in a document so open to criticism, were it not for an important matter of principle which is involved. When the Cunliffe Committee on the British Standards Institution reported to the President of the Board of Trade two years ago, it made a special point of emphasising the desirability of continued independence for the B.S.I. *vis-à-vis* the Government. Yet now we have a Government-sponsored body, which presumably hopes for Government endorsement of its recommendations, telling the Institution what should, or should not, be included in one of its standards. The merits of the particular case aside, this is surely undesirable. Since the Monopolies Commission seems to match

the continuity of its memberships with some ability at establishing precedents, early action is called for. The President of the Board of Trade should inform the Commission that full and obvious independence for the B.S.I. is firm official policy.

DISCOUNT RECONSTRUCTION

CLOSE attention is being given by the E.C.A. to retailing problems at the present time, and this had its effect at the recent annual conference. Attention was focused particularly on the need for active sales promotion, followed by efficient after-sales service to build up goodwill, and on the cost of these activities to the retailer. There was general agreement that some increase in discounts on appliances is necessary if the desired effort is to be made by retailers, but few members were prepared to support the radical proposals made in this respect by Mr. Wathes in his conference paper. These involve a reduction of the basic rate of trade discount, which would be more than balanced by extra allowances for quantity buying and for aggregated yearly purchases. These suggestions appear logical enough, in that they aim at allowing most to the retailer or contractor who makes the maximum effort to sell, but their form as suggested is open to a number of criticisms which were voiced in the discussion. These objections will no doubt attract the attention of the Association's National Committee on Electrical Retailing. But whatever the fate of his detailed suggestions, Mr. Wathes in the paper has demonstrated the bold and constructive nature of the thinking that is available on this new E.C.A. committee, of which he is chairman.

WARNING ON ALUMINIUM

AS an overhead line conductor, aluminium can today claim many advantages over copper from the viewpoint of availability and price. Moreover, since it is well established for use in transmission circuits, application to distribution might be thought to entail few engineering problems. One change that does occur, however, is an increase in the number of connections to copper conductors that are necessary. Recent reports from America, where the pressure for the replacement of copper by aluminium is greater than here, suggest that the difficulties introduced are more serious than had been expected. The danger of electrolytic corrosion at the bimetal joint is of course, well recognised, but it had been expected that the various methods available for overcoming this would prove sufficiently effective. Indeed, cases have been cited where bolted joints between copper and aluminium on shipboard have given no trouble over a score of years. Now it is suggested that under severe test conditions, corrosion is so rapid that even in comparatively favourable circumstances, there could be joint trouble before the useful life of the conductor is reached. So far these reports are not supported by full test results, which in view of the contrary evidence, are obviously necessary. Arrangements are being made to obtain these, and they will be watched for with close attention by distribution engineers in this country, for whom the problem is also important.

REPLACING ROTARIES

THE Southern Region of British Railways has announced its intention to go ahead with the conversion of the high tension distribution system from 25 c/s to 50 c/s. While there can be little doubt that the change is for the good, nevertheless the old rotary substations with their massive machines and rows of meters, usually mounted together with numerous open copper knife switches on marble panels, provided a never-failing source of interest to those who on a hot day could glimpse the interiors through opened doors. Now there will be little save the austere grey of rectifier cubicles. At the turn of the century it was said that the romance of mechanical engineering was killed by the replacement of the reciprocating engine by the steam turbine. There will be many, particularly among the older engineers, who will equally regret the passing of the old rotary converter sub, which played such a prominent part in their early training.

Meteor

D.C.—A.C. CONVERSION

In this Article, Mr. Robert Wells, A.M.I.E.E., further studies the Operation of the Mains Excited Mercury Arc Inverter

IN an article which was published in the ELECTRICAL TIMES dated January 10, 1952, the general theory of inverter operation, and the importance of the grid to cathode voltage wave-form, were dealt with, and practical hints on the use of inverters were given. The article concluded with details of a test which had been carried out on a particular inverter.

In connection with this test, the following additional items of information (omitted at the time) are now given. The inverter transformer had a "Fork-"connected secondary winding of 215 V phase to neutral. The full load rating of the set was 30 amps. d.c.

Also, although the power factor figures were included in the results, and it was shown that there is a change of sign which coincides with the change of direction of a.c. power flow, no mention was made of whether the power factor was a lagging or a leading one. Now it is clear that at the first reading (where the d.c. watts are zero) the power factor will be lagging as here the inverter is merely drawing its no load losses from the a.c. system. The power factor then changes from lagging to leading at the same point as it changes sign and at the same point as the total watts change from positive to negative. This is indicated by the fact that the reading W_1 is invariably greater algebraically than W_2, and for this to be true there must be a change from lagging to leading taking place where the power flow reverses. Thus, what was a lagging power factor for power flow from the a.c. system, becomes a leading power factor for power flow to the a.c. system. It should be noted that although the inverter operates at a leading power factor it cannot be used for normal power factor correction as can a capacitor. This is because it gives out a leading current while a capacitor takes a leading current, and as far as power factor correction is concerned, the effects are opposite. The inverter then could only be used to correct a leading power factor but since such a need seldom (if ever) arises, and since the same duty could be performed with the lagging current taken by an inductive reactor, this is not a practical application. The current flowing between an a.c. system and an inverter then consists of two components—one lagging and from the a.c. system, and one leading and to the a.c. system. The first is necessary to supply the reactive power requirement of the inverter and the second is the means of conveying the inverter output. The total current is the resultant of these two components but due to their opposite senses they cannot resolve into a unity power factor current but only to a zero power factor current (as seen in the original test at 132° anode firing delay).

As an appendix to this original article, it is now proposed to discuss the various ways in which an inverter can be used.

Three Modes of Inverter Operation

An inverter may be used to feed power into an a.c. system of any voltage, from the value for which the transformer primary has been designed, down to zero. Further, it can be made to do this when operating from a d.c. system of any voltage from zero up to that value where

TABLE 2.—RESULTS OF TESTS ON A SMALL SIX-PHASE INVERTER

	A.C. System								D.C. System			
Anode Firing Delay	Line Volts	Line Amps	Volt-Amps	Watts W_1	Watts W_2	Watts Total	Power Factor		$\frac{I}{\sqrt{1+3\left(\frac{W_1-W_2}{W_1+W_2}\right)^2}}$	Volts	Amps	Watts	Eff.
137·0°	400	2·6	1,803	+480	−480	0	0		0	180	2·0	360	0
137·0°	310	2·975	1,598	+ 80	−700	−620	−0·388	LEAD	0·417	180	5·0	900	+68·9
137·0°	290	5·13	2,576	−220	−1,160	−1,380	−0·536	LEAD	0·645	180	10·0	1,800	+76·7
137·0°	284	6·95	3,420	−400	−1,700	−2,100	−0·614	LEAD	0·680	180	15·0	2,700	+77·8
137·0°	278	8·95	4,310	−660	−2,200	−2,860	−0·664	LEAD	0·730	180	20·0	3,600	+79·5
137·0°	266	11·3	5,210	−840	−2,760	−3,600	−0·691	LEAD	0·735	180	25·0	4,500	+80·0
137·0°	264	13·32	6,100	−1,080	−3,360	−4,440	−0·728	LEAD	0·746	180	30·0	5,400	+82·2

the inverter stability limit is reached. At what value of d.c. voltage the stability limit is reached is a factor which depends upon the secondary phase to neutral voltage and upon the amount of anode firing delay in use. However, at any value of a.c. voltage and d.c. voltage within these limits the inverter will operate and its loading will be a function of the controllable factor—anode firing delay.

In inverter operation then there are three variables (d.c. voltage, a.c. voltage, and anode firing delay) any one of which may be treated as an independent variable. This gives three distinct modes of operation, each one suitable for a particular practical application, and it is now proposed to consider each in more detail.

1. Variable Anode Firing Delay

This mode of working is the one which was dealt with in the original article. The test described was made keeping the d.c. voltage and the a.c. voltage constant and with variable anode firing delay controlling the power flow. This mode of working is applicable to straightforward cases where it is desired to transfer power from a d.c. system to an a.c. system and where both systems have a more or less normal, and equal, voltage regulation.

It will be understood that the results given merely show one set of characteristics out of an infinite number all of the same family—as it is possible to carry out this test at any values of constant d.c. and a.c. voltage within the limits as described. In spite of this, it is true to say that when used in this manner there is little or no chance so to adjust the circuit constants as to make the inverter self regulating. This means that in this application external means of varying the anode firing delay (either manually or automatically) must be provided in order to have control of the inverter.

2. Variable A.C. Voltage

If we treat the a.c. voltage as the independent variable and assume the d.c. voltage and amount of anode firing delay as being constant, the characteristics displayed are those that would pertain to an application in which it was required to "stiffen" an a.c. system, by making available to it power from a larger d.c. system.

It is interesting to reflect that if ever high voltage d.c. transmission becomes a generally accomplished fact, with an inverter at the receiving end of the line, it will probably be an inverter of the separately excited type as here being discussed. This being so there will be a relatively small capacity a.c. supply available to serve as a frequency fixer and to provide the necessary wattless current for the inverter transformer magnetisation at the same time. The operation of the inverter for this application will then fall under this heading.

The results of a test carried out on these lines are shown in Table 2 and in graphical form as Fig. 7. (Note. The figures are numbered to continue on from those given in the previous article.) In this case the inverter was set up with normal a.c. volts, and with a d.c. supply of suitable voltage in use the anode firing delay was adjusted to that value which was found to make the a.c. watts zero. This means that prior to the reduction of a.c. voltage there was a small value of d.c. current flowing which was

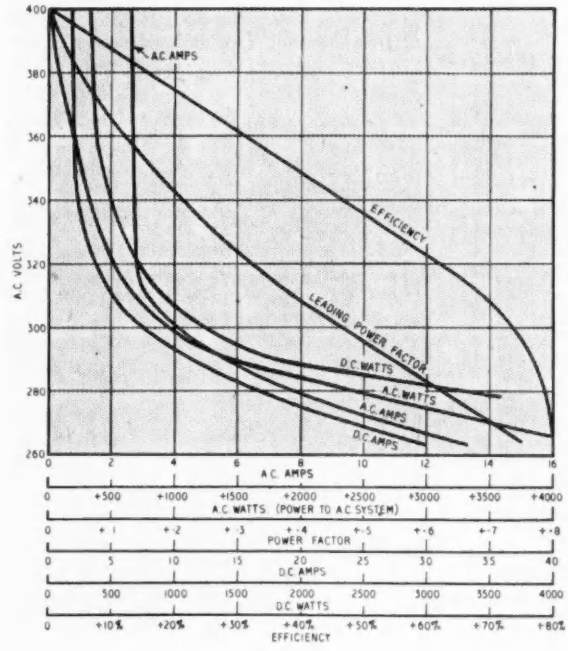

Fig 7. Characteristics of a six-phase inverter: d.c. volts constant (180 volts); firing delay constant (137°); a.c. supply volts varied downward from normal; normal secondary volts, 215 φ—N; fork connection; bulb separately excited (164 watts); d.c. full load = 30 amps.

TABLE 3.—RESULTS OF TESTS ON A SMALL SIX-PHASE INVERTER

	A.C. System								D.C. System			
Anode Firing Delay	Line Volts	Line Amps	Volt-Amps	Watts W_1	Watts W_2	Watts Total	Power Factor	$\frac{1}{\sqrt{1+3\left(\frac{W_1-W_2}{W_1+W_2}\right)^2}}$	Volts	Amps	Watts	Eff.
120°	400	1·695	1,174	+510	−130	+380	+0·324 LAG	0·325	0	0	0	∞
120°	400	2·125	1,472	+600	−290	+310	+0·211 LAG	0·198	70·0	2·0	140	−221·0
120°	400	3·600	2,495	+670	−530	+140	+0·0561 LAG	0·0672	91·0	4·0	364	− 38·5
120°	400	4·425	3,065	+730	−780	− 50	−0·0163 LEAD	0·0191	103·0	6·0	618	+ 8·09
120°	400	5·325	3,690	+790	−1,050	−260	−0·0705 LEAD	0·0812	109·5	8·0	876	+ 29·7
120°	400	6·175	4,280	+830	−1,300	−470	−0·1100 LEAD	0·127	117·0	10·0	1,170	+ 40·2
120°	400	8·050	5,580	+1,060	−2,000	−940	−0·1680 LEAD	0·175	123·0	15·0	1,845	+ 50·9

just sufficient to supply the inverter losses from the d.c. system.

Again it will be understood that the results given represent but one set out of many possible sets, as here the test could be made with other values of constant d.c. voltage and anode firing delay.

Now from a study of the curves set out in Fig. 7 it will be seen that when operated under these conditions the best results for this application are obtained at the lower range of a.c. voltage (where the d.c. voltage becomes greater in relation to the secondary voltage) as here the increase of power transfer per unit drop in a.c. voltage is highest. Having seen this, it becomes clear that to obtain a similar result at a value of a.c. voltage more nearly equal to the normal value (400 for the inverter in question), it would be necessary to use a higher value of d.c. voltage. Also it will be seen that if the maximum change of power transfer per unit change of a.c. voltage is not required it is a simple matter to arrange for the inverter to work over a range where this factor is as required. It becomes possible then, in applications of this kind, to so arrange the design and operating conditions of the inverter that it becomes self-regulating in a manner to suit the voltage regulation of the a.c. and d.c. systems to which it is connected and for it to be instrumental in transferring the desired amount of power from the d.c. system to the a.c. system as the voltage changes of the a.c. system dictate, and without having to resort to automatic variation of anode firing delay. This does not mean that in a practical application of this kind it would be wise to dispense with the means of controlling the anode firing delay; this should obviously be retained as a means of manual adjustment; but it does mean that not only does the inverter become self-regulating but it can also be arranged to be self-regulating in the correct degree.

The inverter used for this test was similar to the one used for the original test—the only difference being in the normal a.c. voltage which was 380 for the inverter used to make the original test and 400 for the inverter used in this test. It should also be noted that during the test now described, it was necessary owing to the considerable variation of a.c. voltage used, to arrange for separate excitation of the bulb. This separate excitation accounts for 164 watts.

The Inherent Voltage Regulation of an Inverter

Since in the foregoing section the performance of an inverter working at a variable a.c. voltage has been considered, it is thought that before leaving this aspect of the subject a few words on the regulation of inverters would not be out of place. The inverter is a piece of apparatus that has been credited with a negative inherent voltage regulation[1]. This idea has come about because the inverter has been treated as a special case of grid controlled rectifier (which treatment is valid up to a point) and the volt-amp. characteristic obtaining at the d.c. terminals has wrongly been considered as the characteristic of the *output*. The output from an inverter is, of course, obtained from its a.c. terminals and the volt-amp. characteristic obtained at these terminals must be considered as representing the inherent voltage regulation of the inverter. Taking this view, the result is a normally positive regulation as can be seen from the curve of a.c. amps. versus a.c. volts on Fig. 7. This curve it will be noticed does not go back to zero a.c. amps. The reason for this is that while it is possible for the power loss of the inverter at no load to be supplied from the d.c. system, it is not possible for the wattless or reactive component of the transformer no load current to be supplied from the d.c. system—this must come from the a.c. system and it is therefore impossible for the a.c. amps. to be zero. It is this condition which is depicted in these results at 400 V a.c.

This case, of an inverter operating from a constant voltage d.c. source, and with a fixed value of anode firing delay, and where the a.c. system voltage is varied in order to vary the

load imposed on the inverter, may be considered as the converse of a rectifier operating from a constant voltage a.c. source, and feeding its output into a "live" d.c. system the voltage of which, if varied, will vary the load imposed on the rectifier in a manner depending upon its inherent voltage regulation. Again, if the a.c. supply voltage of such a rectifier be increased it would take an increased a.c. current, i.e. it would have a rising characteristic at its a.c. terminals in the same way that an inverter has a rising characteristic at its d.c. terminals—in neither case, however, does this represent a negative inherent regulation. Also it should be noted that when a rectifier is used like this, particularly if it is of small capacity relative to the d.c. system into which it is feeding; the grid phase shifter becomes a current controller rather than a voltage controller, as was mentioned in the original article to be the case with an inverter. The fact that in the case of an inverter (of this type) it is an essential requirement for its operation that the systems into which it is feeding be "live", whilst in the case of a rectifier the same thing is not an essential requirement, does not invalidate the reasoning that in both cases the various internal voltage drops are positive if taken in the direction of the power flow and that both inverters and rectifiers have a normal positive inherent regulation.

3. *Variable D.C. Voltage*

If we treat the d.c. voltage as the independent variable and assume the a.c. voltage and amount of anode firing delay as being constant, the characteristics displayed are those that would pertain to an application in which the voltage of the d.c. system tends to rise due to regeneration from decelerating motors over-driven by the kinetic energy of the coupled load. Cases of this kind quite frequently arise in rolling mills, and on traction systems using regenerative braking, particularly if the system is rectifier fed, when, due to the irreversible action of the rectifier there is normally no possibility of the excess d.c. power being transferred to the a.c. system. It will be understood that if say only one motor out of many is regenerating, its output will be absorbed within the d.c. system. The voltage of the d.c. system then will only rise above its no load value at times when the reverse power due to regeneration is in excess of the forward power taken by the remainder of the system.

The results of a test carried out on this basis are shown in Table 3 and in graphical form as Fig. 8. Here the inverter was set up with normal a.c. volts and with 120° anode firing delay so that for any value of d.c. voltage the degree of inversion is a maximum. The test was then made with the d.c. voltage increasing from a low value where the d.c. watts were insufficient to supply the inverter losses, up to the value at which the set was on full d.c. current. The graph of these results (Fig. 8) has been drawn to include only the useful part of this range.

From a study of these results, it will be seen that the inverter has

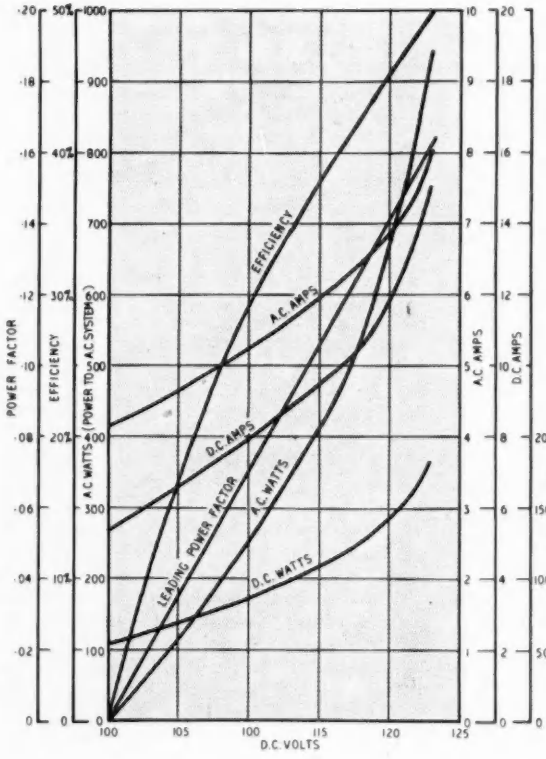

Fig. 8. Characteristics of a six-phase inverter: d.c. volts varied; firing delay constant (120°); a.c. supply constant (400 volts) secondary volts, 193 φ—N; fork connection; d.c. full load=15 amps.

characteristics which make it very suitable for the application of handling regenerated power. Regeneration when it occurs results in the voltage of the d.c. system rising and inherently the inverter will accept more d.c. current. Moreover, the increase of d.c. current and d.c. voltage is not connected by a linear relationship so that dangerous increases of d.c. voltage are prevented by the fact that the power taken from the d.c. system will increase considerably with only a relatively small increase in d.c. voltage. It is possible then to arrange for the inverter to possess this characteristic in the correct degree to suit the amount of regeneration expected in any particular case, but this can only be done by correct choice of the phase to neutral a.c. voltage relative to the d.c. voltage and by operating with the correct amount of anode firing delay. Although in this way the inverter can be made inherently self-regulating to a large degree, it may still be necessary to provide a certain amount of automatic control of the anode firing delay to suit the particular application.

Details of the inverter used for the purpose of this last test are given with (Fig. 8).

In conclusion, it should be pointed out that the results obtained with diminishing a.c. voltage are very similar to those obtained with increasing d.c. voltage as in both cases the changes represent a d.c. voltage which is becoming greater in relation to the transformer secondary voltage. Separate cases have been made out for these two modes of operation, however, as in one case the inverter no load losses are constant due to constant a.c. system voltage, while in the other case the no load losses decrease as the a.c. voltage decreases, and also for the reason that two distinct applications are involved.

As in the original article, the sign of the power and power factor figures as recorded have been reversed to give sense to the efficiency figures and for the graphs.

The author's thanks are due to the Hackbridge and Hewittic Electric Co. for permission to publish this article.

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J. C. Read: "The Calculation of Rectifier and Inverter Performance Characteristics." *I.E.E. Journal*, Vol. 92, Part II, p. 497.

New Shunting Control on UndergrounD

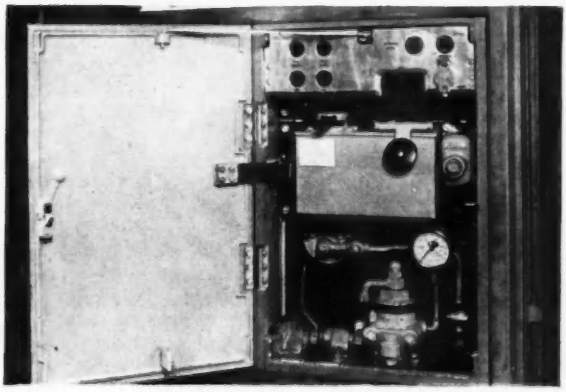
IN the past it has been the practice for Northern and Bakerloo line trains to be made up of three- and four-car units, each set having two driving cabs, one at each end. With a seven-car train, there are thus two driving cabs contiguously placed within the train length. It has further been found that the provision of two fully equipped driver's cabs is expensive. By eliminating one of the cabs, at the point where the only driving facility required is shunting, and substituting a passenger door, the expense is considerably reduced and passenger loading greatly eased.

A new system using a packaged control equipment has therefore been devised. This is housed in a cabinet let into the end panel of the car and contains facilities for all normal shunting movements, operation of automatic coupler and a trip cock. Electric head and tail lights are fitted outside the coach end.

The equipment includes a master control unit controlled by palm-operated push-button, a shunt/series selector switch, interlock switches, brake equipment and whistle control.

When using this driving position, the motorman observes the track through the central corridor door and operates the master controller or brake valve as required with his left hand.

Seventy new cars incorporating this equipment are being manufactured, and twenty-two are being provided by converting non-driving motor cars of 1938 tube stock.



View of operating equipment in motorman's control panel

Fuel and Power

Commons Debate reveals Technical advances in many directions

IN his speech during Monday's House of Commons debate on Fuel and Power, Mr. Geoffrey Lloyd announced that a joint committee of the B.E.A. and Electricite de France had reported favourably on the technical and commercial possibilities of a link between the transmission systems of the two countries. However, a considerable amount of experimental work would be necessary before the scheme became practicable, even if the B.E.A. approved of the project.

Mr. Lloyd also mentioned the possibility of a 400 kV transmission line in this country, noting that the 132 kV grid had never been designed for bulk transmission. Experiments with underground gasification were proving successful, and in two schemes gas of a usable quality had been produced.

Man-power in mining had progressed much better than had been expected when the Government took office. The mild winter had helped to keep stocks up, but man-power improvements had also been effective. This had enabled exports to be increased.

Speaking of the Government's experimental scheme for a £1 m. loan for thermal insulation and other fuel saving equipment, he said that so far over 100 firms had applied for the necessary forms. Ten had completed them, and the total involved here was £86,000. He emphasised that the scheme was essentially experimental.

Coal Output

Earlier, Mr. Robens, opening the debate for the Opposition, had drawn attention to the gap between the N.C.B. planned coal output in coming years and estimates of the country's requirements. If the figures quoted were anywhere near accurate, exports could be expected to fall off disastrously.

Referring to the work of the Ministry's mobile fuel efficiency test units, Mr. Robens called for their wider use, and suggested that in some cases stricter coal rationing of individuals might follow failure to implement recommendations. Another important possible source of coal saving was the Severn Barrage scheme.

In the main the succeeding speeches dealt with the mining industry. There was interest by several members in such possibilities as wind generation, atomic energy, and the Severn Barrage, but the first contribution dealing primarily with electricity came from Sir Arnold Gridley. He spoke of the serious drop in the rate of growth of the use of electricity, and attributed this to three factors : general recession of trade; loss of confidence due to power cuts; and the statements that had been widely made condemning the use of electric power for cooking, water heating and air heating.

Load Factor

Emphasising the need to keep load factor high by filling the valleys in the load curve, Sir Herbert said that unless this were done revenue would drop while capital expenditure continued unabated. As a consequence, prices would have to rise. The use of immersion heaters should in every way be encouraged; he complained about statements that for certain uses electricity should not be used.

Mr. Stewart commented on the consultative council structure of the nationalised industries. He wished to see district committees of the councils formally tied to local authorities, and asked for an independent technical body to be made available to give advice to consultative councils as required. In addition, he asked that there should be some interchange of views between consultative councils in different parts of the country and in different industries. An annual conference might give valuable publicity to the facilities available.

In his summing up of the debate for the Opposition, Mr. H. Neal underlined statements that had been made expressing concern over the problem of safety in mines. Mr. L. Joynson-Hicks, Parliamentary Secretary to the Ministry of Fuel and Power, said that the B.E.A. were reconsidering the designs of power stations to economise in the use of steel and bricks.

With regard to coal stocks, the Parliamentary Secretary predicts 16-17 m. tons by the end of the coal summer. Speaking of the Ridley Committee, he said that it was impossible to know when its report would be forthcoming. He looked forward to its being issued quite shortly.

Finally, in reference to safety in mines, he announced that the department was to embark on preparatory work for a new Bill setting out statutory requirements in this direction.

Our readers' views . . .

Lighting in Control Rooms

THE recent articles published in the ELECTRICAL TIMES dealing with the design of control rooms and manual controls have provided much food for thought. A point of importance, however, on which little work appears to have been done lies in the visual field.

Many control rooms are completely isolated from natural illumination, with the result that the normal light intensity variations of daylight to darkness are absent. Under these artificial conditions, therefore, the eye of the operator is working under constant intensity levels. When to this is added a limited focal distance, such as is common with many meter panel arrangements, optical fatigue, leading to drowsiness, headaches, and boredom, is the result.

LONDON, W.C.1 *C. Oppenheimer*

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Fraudulent Propaganda

MY attention has been called to the illustration and accompanying caption in your issue of June 19, referring to the current Annual Report of the Council for the Preservation of Rural England. The Council is, in effect, accused of "fraudulent propaganda" because the Report reproduced, with permission, this illustration of an undertaking with overhead lines in another country, which had appeared in company with many other pictures of existing disfigurements by overhead lines in this country and elsewhere, in the *Architectural Review*, December, 1951.

The illustrations in the *Architectural Review* were accompanied by a note which states, "It is perhaps necessary to state that no wire has been added to any of the photographs." So far as I am aware, neither the ELECTRICAL TIMES nor any other paper took exception to any of these at the time. So why single out the C.P.R.E. for criticism now?*

I hope that readers of the ELECTRICAL TIMES and the public generally will get hold of this copy of the *Architectural Review* and take a good look at it and be warned in time. Our miniature landscape is very vulnerable and overhead line development on a much smaller scale than that depicted, for the reproduction of which we see no reason to apologise, would, in this country, do just as much harm, if not more.

The object was to indicate the existence and multiplicity of surface and overhead structural development involved in large-scale enterprises of this kind and not to illustrate the disfigurement of the particular landscape shown. We were not concerned with the photographer's art of concealment or exposure, and there is, so far as we are aware, nothing fraudulent about the photograph. The lines and superstructures exist and a black-and-white artist's sketch would have served our purpose just as well. My only regret is that the caption did not make the intention clear.

We have no need to resort to subterfuge as is well known. There are plenty of examples in our own country of disfigurement of this kind on a smaller scale. I enclose one.† Our experience leads us to think that disfigurement from this cause is increasing and that less care is being taken now than in the past to prevent it. The cases cited in the Annual Report are evidence of this.

SECRETARY, C.P.R.E. *H. G. Griffin*

[* *Mr. Griffin is not correct: criticism of this photograph appeared in the* ELECTRICAL TIMES *following its first publication, and the C.P.R.E. were criticised for giving currency to it, since they are a public body.*

† *A photograph of a line in Wales.*—ED.]

B.T.H. RESEARCH FELLOWSHIPS

FOLLOWING its policy of advancement in technical education, the British Thomson-Houston Co. recently instituted annual awards of engineering research fellowships. These are open to honours graduates who are in the last year of apprenticeship with the firm. Holders of the Fellowships will undertake engineering research work for periods of between one and three years, either within the B.T.H. organisation wholly or partly within the company and partly at a university. They will work under the supervision of a senior B.T.H. engineer and under the guidance of a special Research Fellowship Panel.

This year the Fellowships have been awarded to Mr. P. H. G. Allen and Mr. P. C. McNeill. Mr. Allen's work will be concerned with the subject of heat flow in large transformers. On demobilisation he studied at King's College, London, where he obtained his degree in electrical engineering with first-class honours two years ago. Mr. McNeill graduated with first-class honours both in electrical and mechanical engineering, at Queen's University, Belfast, and his research will be on secondary emission coefficients in magnetrons.

LIGHTING AND PRINTING

A Modern Installation at a Large Printing Works is Described in this Article by Mr. T. E. Pickering *

THE present emphasis on the pictorial in some branches of periodical journalism results in the wider use of printing processes which give a more finely graded reproduction of illustrations on a variety of papers than can be obtained from the ordinary half-tone block. The photogravure process, which is now largely used, reproduces the pictures and text together, and the preparation of the copper cylinder from which it is printed involves several stages which do not enter into the production of printed matter direct from type and blocks or stereo plates.

In lighting a modern printing works, therefore, several special requirements are encountered outside those common to all composing and machine rooms. The extent to which these can be met by using one type of fitting for nearly all purposes and standardising the same colour of light source for all general illumination, is demonstrated by an extensive installation recently completed at the works of Sun Printers Ltd., Watford.

Colour Matching

Much of the periodical production at Sun Printers is in colour by the rotary photogravure process. It was therefore decided to use colour-matching fluorescent lamps in all parts of the works and in view of the extent of the installation, the cold cathode type was chosen because of its long life and infrequent need for servicing. When, however, servicing becomes necessary it takes the minimum of time and labour since each fitting is hook suspended and fitted with plug and socket connection for immediate isolation from the supply. The type of fitting used in all main areas is a G.E.C. industrial trough reflector with open top, taking three Osram colour-matching fluorescent lamps.

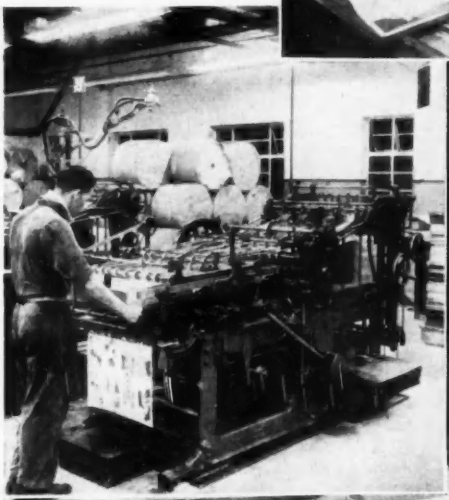
On technical grounds, the merit of the colour-matching light source is that colour proofs are seen with a rendering as close as possible to that of ordinary daylight. Tungsten lamps accentuate reds and yellows in particular, so that a proof appearing satisfactory by their light may in fact be seen to be off-colour when examined in daytime. Experience has shown the economy of time, material and labour, resulting from avoidance of errors of this kind. There is also a psychological aspect of the highest importance in an industry where much work is carried out at night. The pleasant working conditions created by a light approximating so closely to daylight contribute to efficiency and health, and play a most important part in attracting and retaining labour.

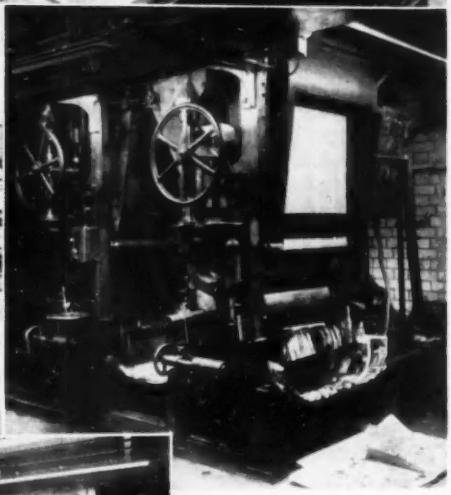
Our heading block shows the general lighting of the main letterpress room by Osram cold cathode lamps in G.E.C. industrial trough reflectors

* *Of the Illuminating Engineering Department, G.E.C.*

Fig. 2. (right). Cold cathode lighting gives good even illumination on composing frames

Fig. 3 (below). The same type of lighting over a letterpress machine





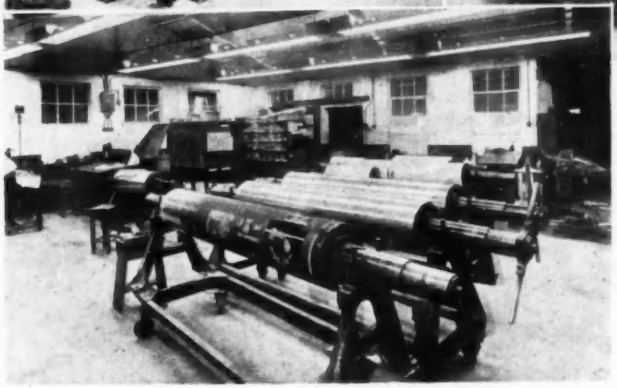


Fig. 4 (above). Cold cathode lighting installed under the platform of a rotary machine

Fig. 5 (left). An average of 60 lumens per sq ft is available in the colour engraving room

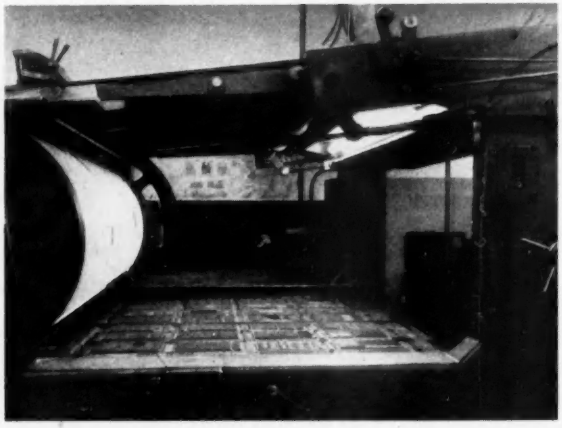


Fig. 6. A parabolic fluorescent reflector and lamp has been installed in the body of this machine to aid in "make-ready"

Coloured originals for reproduction by photogravure are first photographed through filters to obtain the separated colour negatives. After these have been retouched, positives are made from them on which further retouching can be done if necessary, to ensure the tonal values of the originals being rendered as faithfully as possible.

For retouching the negatives and positives, frames were designed with ground glass fronts illuminated from behind by reflector fittings of the same type as those used for general lighting in the works. In this application, the elongated light source provided by the cold cathode tubes is of value in giving even illumination over the whole working area, while the colour rendering properties are as important here for working from the originals as they are at the proof stage.

Photogravure

Type matter has to be set and proofed by ordinary methods, before being photographed for reproduction by photogravure. The copper printing cylinders are prepared for etching by taking a print on carbon tissues of the assembled retouched positives and type. It is in the exposing of the carbon tissue that the fluorescent light source shows considerable advantages over the high pressure mercury vapour source previously used. Not only has it proved possible to decrease exposure times by the use of banks of 40 Osram 5 ft 80 watt blue fluorescent lamps (fig. 7), but the risk of heat causing shrinking of the tissue has been eliminated. These advantages together with a reduction in current consumption and the ability to switch the source on and off at will without waiting for the lamps to cool, combine to place fluorescent lighting well ahead of other sources for this particular process.

The printed carbon tissue is transferred to a copper cylinder, developed and dried. Etching is achieved by applying ferric perchloride to the carbon print; as the solution penetrates through the gelatine film, it attacks the copper underneath and so the varying depths are obtained which give the tonal values. Proofs are then taken and a further retouching process, or revision, is carried out on the copper cylinders themselves. In this section, the new lighting (fig. 5) has not only facilitated the operator's work, but has increased the capacity of the room by enabling the whole floor area to be used. Previously cylinders undergoing revision had to be placed immediately under the tungsten lighting fittings, but with the new installation, the whole room receives an average illumination of 60 lumens per sq ft so that any part is suitable for the work. Fittings are mounted fairly low, at 8 ft 6 in. above floor level, so that each cylinder is well illuminated as far round the curved surface as possible.

Machine Room Lighting

General lighting of all the machine rooms (figs. 3 and 4) has been planned to provide 18 to 20 lumens per sq ft. Some local lighting of machines has been necessary as their size and construction is such that certain parts would have been unavoidably in shadow with general illumination alone. A special design of shallow parabolic reflector has been produced for mounting under the elevated platforms of the rotary machines (fig. 4) to light the lower-parts of the mechanism and controls. This fitting takes a hot cathode lamp of the 5 ft 80 watt or 4 ft 40 watt size and houses the control gear. The fitting for the 4 ft lamp has been specially designed to have an overall depth of only $3\frac{1}{4}$ in. Compact design was essential to avoid obstructing the view of part of the machinery it is desired to illuminate.

Some of the flat-bed letterpress machines elsewhere in the works are provided with built-in fittings to illuminate formes and cylinders during make-ready (fig. 6). In addition to facilitating intricate work, local lighting avoids undue brightness contrasts that would be disturbing when turning from a job in poor light

to some other task in the full illumination of the machine room.

Text and captions for pages reproduced by photogravure are first set in type in the usual way. When the installation was planned it was thought that the compositors would prefer the direction of lighting on their work at night to be the same as that received from the north windows and skylights in daytime, the effect of which is to throw the type face into relief against the body. A section of the composing room was equipped as a trial with the lines of fittings parallel with the cases, in order to reproduce the daytime conditions, but it was found that there was a preference for the alternative arrangement of fittings mounted at right angles to the cases and this latter scheme was adopted. The effect of this is shown in Fig. 2.

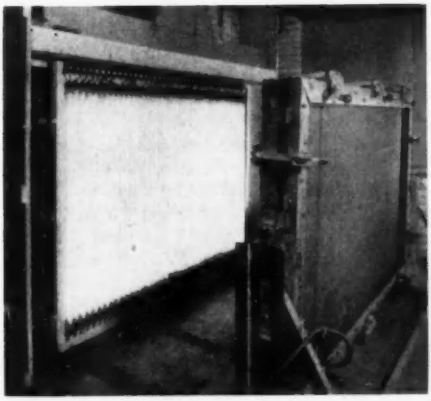


Fig. 7. A bank of 40 5-ft 80 watt blue fluorescent lamps for photo printing work

A smaller composing room has been lighted at the adjacent works of Rembrandt Photogravure Ltd., an associated undertaking of Sun Printers Ltd. (Fig. 9). In this room the ceiling height is only 10 ft so that suspension of fittings was impracticable, and transverse beams at short intervals prevented the installation of ceiling-mounted cold cathode units. Consequently, channel fittings with 5 ft 80 watt hot cathode colour-matching lamps were installed and louvres have been attached to the fittings so that in spite of the low mounting height glare is absent.

Fig. 8. In this composing room, hot cathode colour matching lamps are fitted with louvres to avoid glare

Special Fittings

Local conditions in some sections of the main works, also have made it necessary to use 5 ft 80 watt hot cathode fittings of various types instead of the 8 ft 6 in. cold cathode units. Channel fittings are installed in the cylinder store where the copper printing cylinders are kept in racks after use. The fittings are mounted above the rows of racks to illuminate the intervening gangways and also to provide light for manipulating the cranes and tackle with which the cylinders are lifted into position or removed when needed for further printing. Other installations of channel fittings have been made in the van docks. The binding section is lighted with hot cathode lamps in open trough reflector fittings. The exceptions noted form only a very small proportion of this predominantly cold cathode installation in which some 1,000 three-tube cold cathode units are used.

The installation is of note not only because it is probably the largest fluorescent lighting installation of any printing works in the country, but also because Osram colour-matching lamps are used throughout, making it possible to inspect a colour print under similar conditions whether in office, studio, or machine room.

Our thanks and acknowledgments are due to the Directors of Sun Printers Ltd., Messrs. D. S. Berry (Chief Engineer) and W. E. Hammond, Process Manager, for help in preparation of this article. The electrical work was mainly carried out by George R. Clay Ltd., Watford. All fittings and lamps were supplied by the General Electric Co. Ltd.

Notes on Wiring by MEGOHM

BONDING & EARTHING

Installing Single Core Lead Covered Cables for Generators

THE metallic sheath of a cable is in fact a parallel conductor to the copper conductor of the cable and consequently when an alternating current flows through the cable conductor a voltage will be induced along the metallic sheath which will cause currents to flow in the cable sheath. When the current in the copper conductor of the cable does not exceed 100 amps, the effect of induced sheath current is negligible and generally no special precautions are necessary. However, where currents in excess of 100 amps are to be carried the method of installing cables has to be carefully considered. The voltage induced in the sheath will, of course, be proportional to the current flowing in the cable conductor, and on long cable routes the voltage may rise to a high value on normal load. Further, under fault conditions (i.e. short circuit) the voltage will rapidly rise and arcing may result between the cable sheath and earthed metal.

Cable Runs

From the foregoing the carrying of heavy currents of the order of 1,000-3,000 amps per phase by single core p.i.l.c. cables, for example, between generator and transformer terminals, does require very careful planning and installation. The cable route should be kept as straight and as short as possible and the single-core p.i.l.c. cables should be run in trefoil formation, opening into single formation not more than a few feet away from the termination points at each end of the cable run. The single-core p.i.l.c. cable lengths should also be to all practical intent of equal length and the cables held securely together at intervals not exceeding 2 ft 6 in. with non-magnetic trefoil and single-way cleats. On the trefoil run a wrapping of insulating material such as pressboard capable of withstanding an applied pressure of 2 kV should be wound around the cables and held in position by the trefoil cleats to ensure that the cables are insulated from extraneous earth. On the single cable runs insulated cleats of hard wood or composition type will be found suitable and the cable end boxes and glands must also be of non-magnetic type and the glands should be electrically insulated from the metal work of the equipment.

When the above conditions are met it will be seen that the cables between the equipment, which in this case is the generator and transformer, will be insulated from earth and we can direct the sheath currents where we want them to flow by fitting a bond at the point nearest to the break from trefoil to single formation at each end of the cable run. This bond is made by wiping a piece of lead sheath approximately 4 in. wide around the cables in trefoil leaving a lip on the lead sheath which is reinforced with 1 in. by $\frac{1}{8}$ in. copper strap suitably drilled to enable bolted connections to be made to the earthing system. On long cable runs similar bonds should be made at intermediate positions on the cable route. It will be seen by the above arrangements that the sheath currents are now directed to earth by a positive low resistance path from the cable sheath to the earth electrode, and there is little possibility even under fault conditions, i.e. short circuiting of the system, that arcing can take place on the cable route.

Separate Earth Bonds

Where currents to be carried between equipment necessitate the use of one or more single-core p.i.l.c. cables per phase, the cables should be run in trefoil formation and in three-phase groups. It is also important that they are arranged in symmetrical formation so that the lengths of the cable in each group are equal and they should be insulated, bonded and earthed as described above.

Whilst on the subject of bonding and earthing, is it really necessary on low voltage metal-clad switchboards comprising individual iron-clad fuse switch units mounted above and below a bus bar chamber and firmly bolted to a substantial earthed angle-iron switch frame, for separate copper tape bonds to be fitted and connected between a copper base tape on the switch frame and the individual switchfuse units? Or is this an obsolete and extravagant method wasting valuable time and materials which today are in short supply?

Air Cooled Chokes

For Fluorescent Lamps

Accessory is for use with enclosed type fittings

By W. A. STICKLEY
(Ekco-Ensign Electric Co. Ltd.)

Fig. 3. Typical brick type varnished choke for one 80 W fluorescent lamp. The gap A is one of the three air-circulation apertures provided

THE air-cooled varnish impregnated choke has now become well known to the lighting industry, the name describing a modern form of fluorescent lighting choke having no bituminous filling compound. Such chokes are constructed so that varnish impregnation can be carried out after assembly and with case and terminal blocks in position.

The varnished choke was introduced to the industry some two years ago to meet a particular need which arose when the practice became established of using multi-lamp lighting fittings, especially those fitted with enclosed or semi-enclosed plastic or glass diffusers. It was found that under these conditions the temperature round the chokes caused leakage of the filling compound and failure of the choke insulation resulted.

This temperature effect was not noticeable in earlier types of fluorescent fittings for they were usually good radiators of heat, and the compound filled type of control gear was generally found to be satisfactory. The 80-watt fluorescent lighting fitting shown in Fig. 1 is an excellent example of an early but still very popular industrial fitting giving maximum light on the working plane and having exceptionally good heat radiating qualities. It was also at that time considered that the surface brightness of an unscreened fluorescent lamp might not be too high for general comfort. This was founded more on the experience of single lamp fittings at relatively high ceiling heights. With the introduction of the new decorative types of fittings diffusers became popular and the result was that much higher temperatures developed round the control gear and the need for a new type of choke became apparent. The condition was aggravated by the use of multi-lamp fittings which, in some cases, contained eight or more lamps with the consequent accumulation of heat due to ballast losses and high ambient temperatures. Thus ballasts were expected to operate at temperatures as high as 80° C in some cases. Normally, compound filled types met even this requirement but with the variation of mains supply voltage nowadays encountered, and/or a fault condition, temperatures could be, under some conditions, as high as 110° C and compound flow resulted. The varnished choke was therefore introduced and the heat problem was overcome so far as the choke was concerned.

Fig. 2 shows a very modern twin 80-watt fitting whose control gear temperature is increased by the blanketing effect of warm lamps, a diffuser and the reflected heat from the ceiling to which it is fixed. Varnished chokes are used very successfully in this fitting.

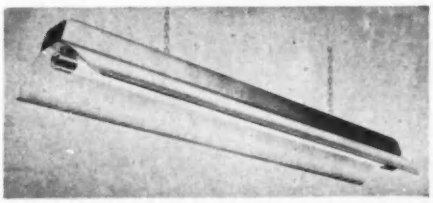


Fig. 1 (above). Industrial type 80 W fluorescent fitting for which compound filled chokes are found to be fully satisfactory

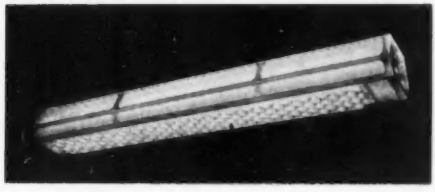


Fig. 2 (right). Modern twin-lamp fitting of the type for which air-cooled varnish impregnated chokes are particularly suitable

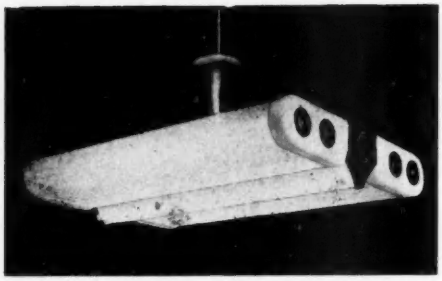


Fig. 4. Pendant fitting containing four 40 W 2-ft lamps complete with control gear

Fig. 4 shows a pendant lighting fitting containing four 40-watt fluorescent lamps complete with control gear. Varnished chokes are used in this fitting and the user can be confident in this case also that his very attractive lighting fitting is not going to be spoiled by leakage of overheated compound from the chokes.

General Description

The varnished choke is an iron-cored inductor housed in a mechanically protecting and magnetically shielding case with apertures at its ends for air circulation and better cooling. The whole choke, inside and out, the internal wiring, and even the joints between the coil leads and terminals, are impregnated and covered by a thick film of varnish. This varnish is of the oil modified synthetic resin type and is thermo-setting and practically unaffected by extremes of heat and cold, humidity, mould growth or seawater.

Varnished chokes are made in brick 80 W or section 20-40 W. They are generally physically smaller than other known types. A typical 80-watt brick type construction, Fig. 3, shows one of the three air-circulation apertures. This can be seen at A above the terminal block. Two other apertures are at the other end and are therefore not visible. Electrical specification and physical dimensions are given in the table.

Tests have proved that this class of ballast will have a very long operating life at tempera-

ELECTRICAL SPECIFICATION AND PHYSICAL DIMENSIONS OF AN AIR-COOLED VARNISHED CHOKE FOR USE WITH ONE 80-WATT 5-FT FLUORESCENT LAMP

Mains input range	200/250 V, 50 cycles
Lamp-operating current ...	0·85 amps.
Lamp starting current ...	1·1-1·5 amps.
Insulation resistance at 20° C	Not less than 100 megohms
Flash test between coil and frame	2,000 V, r.m.s.
Length	6½ in.
Width	3 1/16 in.
Height	2½ in.
Fixing centres...	6 in.
Weight...	4·7 lb.

tures as high as 130° C. It is not recommended, however, that designers should aim for normal working temperatures higher than 95° C. The margin thus obtained will accommodate the extra heat when an abnormal condition prevails.

Special Note

The temperatures mentioned above are those which would be recorded by a measurement made at the hottest point on the surface of the choke or ballast container and include the heat generated by the ballast and ambient temperature.

Measuring 'Static' on Buses

RECENTLY a question was asked in the House of Commons concerning shocks received by passengers when boarding public transport vehicles. Cases of this nature, so far as London Transport is concerned, have dwindled almost to nothing since the introduction, in 1948, of electrically conductive rubber tyres.

Moreover, following the Dunlop Rubber Company's invention—the stati-gun—this danger is likely to be reduced still further. This equipment has been developed to provide portable means, whereby charges of static electricity built up on road vehicles can be quickly measured. It was shown at the recent conference on Industrial Physics in Glasgow.

The Baldwin-Dunlop stati-gun employs a triode valve, specially constructed to give the grid an insulation and leakage resistance up to ten million times that of the normal valve. Under these conditions, static charges induced on the grid by those being measured are retained for several minutes, enabling their measurement to be made with some accuracy. An open-ended tube houses the valve, and measurements are made by pointing this tube at the surface under examination at about a foot distant from it, the recording scale being mounted at the other end of the tube. Associated equipment is carried in a box slung over the operator's shoulder.

Measuring voltages from 100 V to 200,000 V, and additionally the polarity capacitance and quantity of static charges, this equipment provides, in effect, resources of an electrostatic laboratory in an easily portable form.

DISCUSSION at the E.C.A. Conference

Accounting and discount policy provide subjects for comment

HEAT-WAVE conditions did not interfere with the smooth and successful functioning of the E.C.A. conference, nor inhibit the willingness of the members to express their views forcibly. After the presidential address, which we reported last week, the meeting turned to the consideration of the papers that had been prepared for the annual conference.

Accounting

Accounting is a subject that hardly seemed likely to excite contractors to vigorous discussion; yet although the first of the two papers presented had the title "Accounting for Electrical Contractors," the ensuing debate was long and lively. Credit for this must largely go to the author, MR. F. SEWELL BRAY, F.C.A., F.S.A.A., who presented an excellent summary of his written paper. He declared his liking for simple accounting systems, which should provide the management of a business with reliable reports on past happenings, on which policy decisions could be based.

Summary accounts at regular intervals should be prepared, starting with the value of sales, and subtracting from this the cost of those sales (wages, materials and change in stocks and work in progress). The resulting balance—the gross profit—should never be permitted to fall below the fixed expenses of the business. Expenses that varied with turnover were to some extent controllable; fixed expenses, on the other hand, were not easily reduced unless extreme remedies were called for. Ultimate profit was obtained by subtracting from gross profit, administration, management, selling and financial expenses, and then making provision for taxation.

The balance sheet of a business set out the capital that was being employed in its operation. It could be a useful guide to financial policy, group figures moving between certain limits if financial stability were being maintained. Backing up the balance sheet should be a statement clearing up the question, where have the profits gone? This should take account of withdrawals from the business; change in stocks and work in progress and in debtors; purchase of plant; changes in cash balances; and change in amounts due to suppliers.

If accounts were prepared at intervals of less than one year, a method had to be employed for valuing inventories without taking a physical count. To obtain the necessary figures it was necessary to maintain subsidiary records to reflect the cost of materials purchased and their selling value.

As regards estimates, Mr. Sewell Bray advocated two percentages being added for gross

Members of the Council of the Electrical Contractors Association

Speakers seen here are, l. to r., Mr. F. Sewell Bray reading his paper, and Mr. R. Drake discussing it; Mr. Wathes dealing with retailing; and the President, Mr. Stanley Watkins, delivering his address

profit, one for materials and the other for labour. The percentage added to labour should be sufficient to give a yield to cover administration, selling and financial expenses and a margin of profit.

Discussion

MR. S. L. M. BARLOW (London), opening the discussion on this paper, raised several queries of a technical (accounting) nature. In particular, he questioned the author's definition of current assets as those realisable within one year. He asked the effect on this of work in progress on a big contract, which might last three years. MR. R. DRAKE (London) wanted to know the best method of estimating the profit to be charged on work in progress at the end of the month, if this were used as the accounting period. It seemed to him that one of the main reasons for keeping accounts was to enable estimates to be kept accurate and up to date. In electrical contracting, types of work varied very considerably, and it was difficult to distribute overheads between jobs. So far as he knew, there was no adequate accounting method of allowing this to be done.

MR. F. W. BLANSHARD (Purley) said that even a month was too late to have accountancy figures if they indicated any change. Work in progress was the most important part of accounts. In his opinion, the only way to run a job was to split contracts into a number of small sections and plan the order in which they were to be tackled. The cost of the sections and their progress could then be compared with estimates. MR. M. SADLER (Ashbourne), speaking from the point of view of the medium-sized contractor, said that his difficulty with a monthly statement of accounts was obtaining the value of the stock in hand. This was spread over six buildings, and the margin available from contracting did not allow a big office staff to be carried. He also thought that overheads could vary a lot with value of job.

MR. A. APPS (Canterbury) failed to see how it was possible to assess £30,000 worth of stock at monthly intervals. He asked if it was possible to set a safe margin for unproductive wages; businesses were all too easily loaded up in this way. MR. S. PONTON (Bournemouth) said that he had been advised to bring out on every job sheet the cost of operatives and what had been charged for their labour, as a method of showing the profit made. MR. W. FURSE (Nottingham) asked if overheads should be added in the value of work in hand at the end of the year. If the Inland Revenue Authorities tried to insist on this, should they be resisted?

Small Contractors

Another speaker spoke of the effect of purchase tax making turnover on showrooms seem unreasonably small, while MR. HANDS (Colchester), speaking as a small contractor, suggested that the E.C.A. should prepare forms and graphs which, when filled in, would show the contractor his trading position, and where the weakness lay. He also thought the Association should give particulars of legitimate expenses that could be claimed by contractors against income tax. MR. HYAMS (Hove) recommended specialisation by accountants on one type of business.

In his reply, Mr. Sewell Bray dealt with many of the detailed points that had been raised. On the difficulty of estimating overheads, he suggested that the question should be asked, are materials or labour the more important element in the job? Overhead expenses should then be recorded in proportion to the predominant feature.

He agreed that work in progress was the weak link in the argument for monthly accounting. The accountant was in the hands of the tech-

nician here; only he could speak on the control of the contract, and whether it was up to time. In conclusion, he agreed with one speaker that accounting was not an exact science, but thought it could be made nearer one than at present.

Retailing

Retailing as a branch of the electrical contractor's business was considered by MR. H. S. WATHES, chairman of the N.E.C.T.A. Electrical Retailers' National Committee. He allowed himself plenty of scope by choosing as his title "This business of electrical retailing," and proceeded to take full advantage of this.

Only a few points can here be picked out from a long paper, which he amplified at the meeting. With regard to window displays, he advocated moderation between the high-lighted single subject and the crowded "village general store" window. Staff needed careful training, and they also required a high standard of supervision. He preferred men for sales work.

As regards stock, he did not think that an electrical retailer need, or even should, handle a comprehensive line of appliances and fittings. It was, in addition, bad policy to try to sell a customer a substitute for what he wanted. As against these points, radio should be handled by almost every electrical retailer.

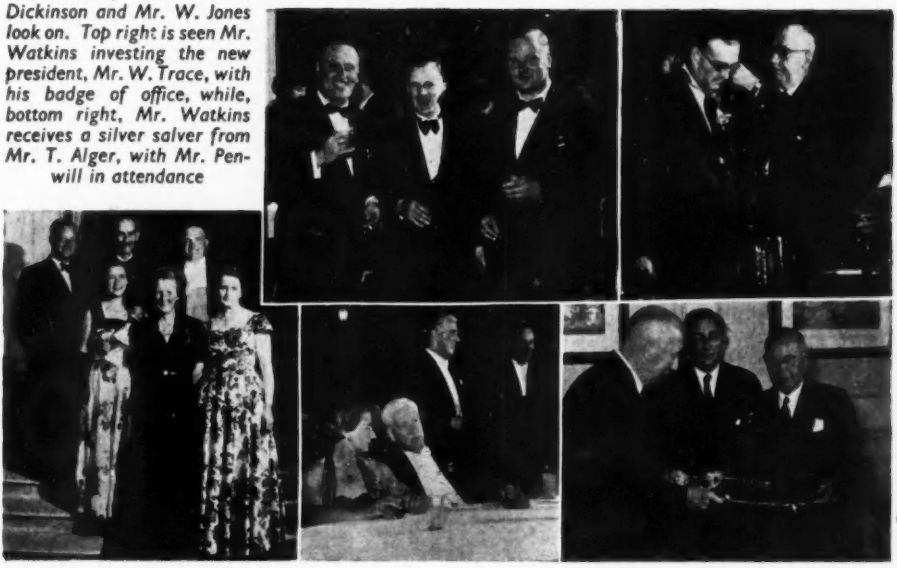
Sales promotion activities should include selective circularising and a regular scrutiny of sales ledger, etc., to locate dormant accounts which might be followed up. The well-turned-out commercial vehicle was an immensely valuable form of advertising. In his opinion, very little real selling was done by sales staffs today. These personnel needed to know the products they were handling, their capabilities, and their application. Further than this, they should know competitive products as well.

Thorough demonstrations should be offered to customers at the prospect stage, and again after the deal had been closed. Every piece of major equipment should be properly demonstrated in the user's home, under working conditions. Next came the question of after-sales service. Membership of N.E.C.T.A. implied that a business should "be able to provide by its own staff or otherwise adequate after-sales service." In many cases, Mr. Wathes suggested, it might be an advantage for the customer for the service to be in the hands of specialists. As a good-will builder, it was worth while having a service man call on a customer occasionally without being sent for.

Discount Policy

Finally in the paper came the consideration of discount policy. He did not agree that a general increase in trade discounts was desir-

Varied convention activities are pictured in the group below. Bottom left are seen Messrs. W. F. Parker, R. E. Bristow and E. Peacop with their ladies at one of the receptions. At another reception are seen three Bournemouth E.C.A. members, Messrs. A. Kitcher, C. Hadley, and S. Ponton; and below Lord Citrine is in conversation, while Mr. S. Dickinson and Mr. W. Jones look on. Top right is seen Mr. Watkins investing the new president, Mr. W. Trace, with his badge of office, while, bottom right, Mr. Watkins receives a silver salver from Mr. T. Alger, with Mr. Penwill in attendance



able or in the best interests of the industry as a whole, or of the general public. On the other hand, it could be proved from readily available statistics that present margins were insufficient to run such a sales organisation as had been described. He suggested as a basis for discussion the establishment of a relatively low basic discount, providing an adequate reward for the type of business which merely called forward a particular piece of equipment. Then there should be an increased discount on a quantity delivery basis, and finally the possibility of a bonus on total purchases over a period.

Discussion

In the discussion, MR. A. MELVIN TURNER (Altrincham) thought that supervision of staff was the weakest link in retailing today, particularly where the principals of a firm were mainly interested in its contracting side. He thought calling on dormant accounts might be expensive. Cutting down basic discounts would not help the smaller members of the Association, whose support and interest were so necessary to its welfare. MR. F. HUMBER (Manchester) thought an outstanding problem was that of converting a non-user into a consumer of electricity. Because of recent attacks, many people were rather frightened of using electricity. It was of paramount importance that retailers and staffs should be fully equipped to use the data that was available on the relative efficiency of various fuels.

MR. WALKER emphasised that after-sales service was very expensive, and suggested that manufacturers might see that their products were better turned out. He did not feel that the idea of a discount for quantity buying was very good, as such buying was highly dangerous, because of "fashions" in appliances which, changing, left stock on hand. He suggested that the price of a product should be stated plus a certain sum to provide after-sales service for a given period. This might lower basic prices while attracting less p.t. MR. A. C. HAZEL (Hurseal) asked, as a manufacturer, what the trade wanted in the way of discounts. Manufacturers had to supply an enormous amount of service and advice. He liked the author's idea for a bonus discount. MR. H. F. TRUMAN (Walsall) suggested that contractors should be capable of training their own staffs. He did not think that full after-sales service could be afforded on a 15% discount. Sometimes the manufacturer was getting appliances across to the customer at the expense of the retailer.

MR. W. BIRD (London) did not think retailing arrangements were truly adequate and efficient. Since the lady did most of the buying, shops should be flexible and concentrate on beauty. Great industry and drive would be needed to fight the gas interests. MR. P. G. WALLIS (Maidstone) spoke from experience of the greater effectiveness of tungsten as against fluorescent lighting as a crowd-attractor for window displays. MR. EVANS thought that few items should be placed in the window. He disagreed with the idea of a low basic discount.

MR. R. GRIFFIN (Leighton Buzzard), speaking as a small retailer, felt that contracting should be kept well separate from retailing. Purchase tax was causing an acute financial problem for retailers. He thought manufacturers might help out. MR. T. JONES (Liverpool) asked for stronger steps to stop wholesalers making cash sales to the public.

Mr. Wathes made two replies to the discussion. In the first, he emphasised that any new retail structure must give a fair deal to the small man. He emphasised, in reply to Mr. Humber, that if it were against the national policy to use electricity for space heating, he would not train staff to sabotage the national effort. Staff training in general was best done on the shop floor. The real purpose of his paper was to show how retailers required more money if they were to do their jobs properly. Later he said that he did not think that manufacturers could be expected to cover any purchase-tax costs.

RUST INHIBITION

OF the major problems continuing to beset engineering industries today, that of metal corrosion or rusting is one of the most important. Monsanto Chemicals Ltd. announced recently the discovery that sodium benzoate, previously in use as an anti-freeze additive, had the additional attribute of restricting corrosion. This quality, first noticed almost by chance, has been since established by testing the compound under strict conditions. Although sodium benzoate has been used primarily in aqueous solutions, when incorporated, for example, into wrapping materials, heat exchange media, adhesives and textile emulsions, its corrosion inhibiting properties are not impaired, providing the concentration of any chloride or sulphate present does not exceed 0·25%. Applications where its use might prove economic include cutting oils and solutions, paints, and in fibrous core strands of wire ropes.

Problems and Practice IN ENGINEERING

Brush-Axis Misalignment

SOME rather peculiar symptoms made attention necessary to a fractional horse-power d.c. motor circuit employing a normal type face plate starter.

During the course of a usual starting sequence, initial movement of the starter arm produced what appeared to be normal results as regards rotation and direction of the armature. Continued movement of the arm, however, produced immediately an abrupt change in the direction of rotation and an accelerated speed, and this continued until the starter arm reached its final "on" position when the armature again reversed direction and proceeded to run quite normally.

Obviously there was a fault in the starter and this turned out to be a broken resistance between the first and second studs, so that, actually, initial starting was only being effected at the point where the contact shoe shorted the first and second live studs. When the shoe parted with the first stud the armature abruptly stopped and reversed, through the shunt field circuit becoming broken, and this situation remained substantially the same until that circuit was once again completed through the arm finally making contact with the no-volt magnet, to whose frame the shunt lead is often connected.

The problem was now reduced to the cause of reversal when shunt excitation was removed, and, naturally, the idea of a wrongly connected series field circuit immediately suggested itself. Investigation, however, revealed that the machine was of the pure shunt wound type. Nevertheless, the field magnets were somehow being energised, and, apparently, the only remaining explanation (since residual magnetisation was disposed of by the fact that the armature had reversed direction), was that the brushes had a "backward lead" of such an angle that armature reaction was producing an active demagnetising component sufficient, at first, to reduce to zero the residual magnetisation left behind by shunt excitation, then to produce enough reverse flux to start rotation in the opposite direction.

In order to attempt to prove this, the shunt was left disconnected and the motor started up in reverse by merely completing the armature circuit. The brushes were then rocked backwards (in relation to the new direction) until the armature ceased to rotate. Further movement of the rocker arm in the same direction seemed to establish this explanation, the armature again commencing rotation but in the reverse (or normal) direction.—*F. Butcher.*

Welcome Advantage in Front-connected Apparatus

THE house-service pattern of meter, fitted with a front terminal block, is invariably used for small supplies—the rear-connected pattern naturally being favoured for mounting on panels associated with big MV and HV supplies. Some years ago the writer had to initiate the maintenance of a large number of metering equipments, and somewhat to his surprise found that, although cubicles and trucks housing MV and HV gear were used, the meters and a certain amount of other apparatus thereon were all front-connected. This, however, as you will see, turned out to be a godsend.

The state of the apparatus generally was such that it was necessary for full overhaul and recalibration to be carried out, and in order that this work be systematised, it was necessary to remove and re-install the meters at any time and without regard to the ruling load conditions. This was made possible by arranging for all fixing-bolts in every equipment to be *reversed* and each nutted to the panel—the apparatus being then pushed on to the protruding screwed stems and secured by outer washers and nuts.

The sub-station department rapidly carried out this preliminary work. Later, over an extended period, the meter-and-test department, usually during normal hours, was able to remove and later re-fix meters readily. For, in addition to this new facility, it was also possible at the front of the cubicles or trucks for the voltage circuits to be made dead at their fusible cut-outs, and the current transformer secondary circuits temporarily "shorted." In this wise servicing was steadily, safely and effectively carried out.—*G. E. M.*

Contributions to this page dealing with specific items of interest to electrical engineers and maintenance men are welcome, and, if accepted, will be paid for at our standard rates. Problems of a practical nature to which a solution is required will also be considered. Contributions should be written on one side of the paper only and may be accompanied by sketches, which will be re-drawn for publication.

LUBRICATION PROBLEMS

Greases for Ball Bearings in Electric Motors and other Rotating Machines

By "WORKS ENGINEER"

ELECTRIC motors are used under all sorts of conditions today, and it is essential that the greases used in the machines should be suitable for the conditions under which the motors work. Correct lubrication is of vital importance. It ranks with proper mounting and the selection of the right size of bearings. Since the operation of ball bearings is so simple and easy, insufficient attention is frequently given to their lubrication. The main duties of ball and roller bearing lubrications are:—

(1) To protect the bearing from rust and wear.

(2) To assist in dissipating heat generated within the bearings.

(3) To minimise the friction between stationary and moving parts.

Lubricants for ball and roller bearings should be free from abrasive materials. Contamination very often takes place through careless handling. There is no doubt that much of the time spent on maintenance and loss of production can be attributed to dirt in the lubrication either through abrasive action or through interference with the proper functioning of the lubricating mechanism.

All containers, grease guns, etc., must be kept scrupulously clean. No container should be filled with grease without first ensuring that it is clean, and when filled it must have a dust-tight lid to close it. Each container must be marked with the grade name and must be solely used for the grade indicated.

The best way of determining the time between the renewals of grease is by periodic inspection; and, as a general rule, renewal every six months is satisfactory. When renewing the lubricant it is most advisable that the old lubricant be removed by means of a hardwood scoop. Never use cotton waste or cloth for removal of the old grease, and care should be taken that none of the surfaces are scratched. If a bearing has to be swilled out, never use paraffin. Petrol, benzol or trichlorethylene are recommended for flushing, and to give protection against drying after cleaning with the above, always flush the bearings with a thin mineral oil.

Properties of Greases

So much for the precautions to be taken with greases. To add to this it should be noted that engineers should know something about the properties of greases for electric motor use. All greases consist of a mixture of a soap base and an oil. The soaps in general use have either a calcium, sodium or lithium base. There are other bases as well which have similar characteristics and are used in a similar manner but to a lesser degree. They are barium, strontium and aluminium. Each base has its own peculiar characteristic which makes it suitable for its own range of application and the correct type of grease ought to be chosen for each particular application.

It should be noted that the soap bases are alkaline; calcium, barium and strontium are alkali earths, and sodium and lithium are in the general group alkali metals.

Calcium- or lime-based greases are smooth in texture like butter and are most suitable for bearings which run neither at high temperature nor high speeds. They contain a small percentage of water to make them stable, and if the temperature increases too much this evaporates and the stability of the greases is lost and the oil separates from the base. Calcium-based greases are water resistant.

Sodium- or soda-based greases do not contain water and are thus more stable at higher temperatures. They are most suitable for normal electric motors. Some sodium-based greases are fibrous and these should be avoided in favour of greases of smoother texture. This form of grease emulsifies in water; and whilst this property is useful in protecting bearings against rust, in damp situations excess of water will cause the grease to be washed out of the bearings with consequent damage.

Lithium-based greases are a more recent introduction and they are finding wide application because of their suitability for a wide range of working temperature. Compounded with suitable oils they are used for grease lubrication of bearings operating at both ends of the temperature scale. Lithium-based greases are smooth and water resistant, but the scarcity of the base material makes them costly and this prevents their general use. They

can be best used for stoker motors and refrigerating plant motors.

Failures of Lubricants

Greases behave in different ways and two distinct types of failure are obtained: those which occur during running and those which fail at a "cold start." Failures which occur during running may be of two different kinds, namely, the temperature of the bearing may rise slowly, showing that the grease has slumped in the bearing, or it may rise in temperature rapidly, showing that the bearing has run "dry." This latter condition is usually shown up by the temperature rise and noise.

Grease life in a bearing under operating conditions is not the sole criterion of the value of that grease. It must be stable when it is stationary and its life whilst in stores must be satisfactory. This can be measured by the rate of oil release and rate of oxidation.

Temperature tests give comparative values of the same greases. The no-load losses on a motor may also vary with the deterioration of the grease in the bearing and this may be used as a measure of the value of the grease. Ammeter readings on the starter are very important. Abnormal readings show that there may be something wrong with the grease in the bearings with consequent high torque effects.

Portugal Doubles H.E. Plant

AN outstanding achievement in European economic development is reflected in the greatly increased use of Portuguese water power for electricity generation. In 1950 hydro-electric power stations supplied 45% of the total energy; in 1951, this figure had jumped to the high value of 81%, the significance of which is shown by an increase of only 13% overall.

This is the latest step towards providing the whole of Portugal with cheap electric power, a far-reaching scheme inaugurated at the end of 1944 and now beginning to have gratifying effects. From the results, which mean in terms of units generated, an increase from 392·5 million kW/hr to 768·2 millions of hydro-electric production, while thermal stations' supply fell from 444·1 millions to 178·0 millions, one aim of the plan, namely, the reduction of fuel imports, has succeeded. Total energy consumed reached 940·6 million units, an increase of 12·4% the previous year. Consumption per head was 119 kWh, compared with 870 for for the U.K. (Portuguese figures).

In view of the country's geography, two types of H.E. can be used in Portugal. High head stations are the older type, but more recently, under the development plan, greater use has been made of river projects. It is from this power source that most of the increase in H.E. generation has been obtained. Six stations, having an installed capacity of 157·2 MW, have been opened and extensions to three others brought the total H.E. installed capacity to 345·7 MW.

Comparing the sizes of stations and their contribution to the total generated it is seen that, for hydro-electric stations, there are two stations with a capacity greater than 50 MW, generating little more than half the total output, whereas 18 stations, less than 5 MW capacity, provide less than one-tenth. The total distribution of output is shown below.

Of these thermal stations, seven are turbo sets, which are, with two exceptions, above 10kW capacity, three are diesel sets, and the smallest, steam driven.

Stations—graded in terms of installed capacity	Number of stations	Installed capacity		Production in 1951	
		MW	MVA	million kWh	% of total
Hydro-electric Stations					
Greater than 50 MW	2	166·6	202.3	406·5	53
Between 50 MW and 40·1 MW	1	43·2	60·0	68·7	8·9
Between 20 MW and 10·1 MW	7	93·3	115·3	185·8	24·2
Between 10 MW and 5 MW	2	12·0	14·5	38·4	5·0
Less than 5 MW	18	30·6	36·9	68·8	8·9
Total	30	345·7	429·0	768·2	100
Thermal Stations					
Greater than 20 MW	1	68·0	74·0	65·4	36·7
Between 20 MW and 15·1 MW	1	16·2	19·0	2·2	1·2
Between 15 MW and 10·1 MW	3	37·3	43·6	72·9	41·0
Between 10 MW and 5 MW	1	8·5	12·8	32·4	18·2
Less than 5 MW	5	4·5	5·5	5·1	2·9
Total	11	134·5	154·9	178·0	100

overseas news

Rural Development

A new power station is to be erected at a coalfield north of Inverell, the New South Wales Minister for Public Works, Mr. Renshaw, announced a few days ago. He said the Government had given authorisation for the development of a new coal-mine at Ashford which would feed a 10,000 kW power station. The latter would supply an area of 18,000 square miles by 1958. The Government aimed at electrifying every farm and station property in N.S.W. within the next seven years, he added. The Government would contribute in subsidies £2,750,000 towards the £5 million needed for approved electricity services to supply 8,000 new rural consumers.

Burdekin Hopes

The first report of the Burdekin River Authority, Queensland (which was appointed by the Government in 1950 to undertake construction and management of the project), claims that full production from this irrigation and power scheme should be reached by 1960. The hydro-electric power station will have an installed capacity of 120 MW, providing an estimated annual revenue of £2 million, while 780 farms, covering a total area of 23,820 acres, will be irrigated. The project will utilise the waters of the Burdekin River and its tributaries, which form one of the major river systems in Queensland. A dam 150 ft high is to be constructed, creating a 286 square mile lake.

Packaged Plant

Brisbane City Council hopes to have its "packaged" power plants in operation early next year. Giving this information recently, Ald. W. C. Coutts, chairman of the Electricity Committee, said that subject to the financial position (the Council had to make payment of £108,308 by the end of June), erection of the boiler plant would begin on August 1, and it was hoped that the first 5,000 kW set would be working by February 1 and the second by March 31.

Big Rise in Manitoba

A 23% increase in units sold is recorded by the Manitoba Hydro-Electric Power Commission for the year ended March 31 last. The total was 325·2 million units. A further 8,500 consumers were connected, including 5,000 farms and 24 villages and hamlets, bringing the total at March 31 last to over 77,000. The year was also noteworthy for the extensive system improvements carried out by the erection of additional 66 kV and 33 kV lines, and the 115 kV tie-line from Transcona. The 1952 construction programme is expected to be equally active, and this summer the Commission plans to electrify an additional 5,000 farms and extend services to another 21 villages and hamlets.

B.C. Station

The Clowhom Falls hydro-electric plant of the British Columbia Power Commission was officially opened a few days ago. Situated on the Sechelt inlet, it has two 2,000 kW generators. The associated 22-mile long 60 kV transmission line is considered one of the toughest construction jobs yet carried out by the Commission's crews. The 60 kV line zig-zags back and forth up and down 16 miles of steep shoreline, then climbs through a 2,500 ft mountain pass to Sechelt.

Line Patrol

The use of four helicopters with occasional ground-crew inspections, had cut almost by half the cost per mile of the line patrol activities of the Hydro-Electric Power Commission of Ontario, Mr. R. H. Saunders, chairman of the Commission, has revealed. The main saving, he stated, was in the cost of the housing, trucks and equipment necessary for the original foot and automobile patrols. To keep a check in the transmission network, the province is divided into 12 patrol areas. Since the inception of this method of powerline inspection in June, 1949, the Commission's air patrols have covered over 110,000 miles, the four pilots having logged approximately 2,541 flying hours in that period. One helicopter with a two-man, pilot-observer crew, can inspect approximately 100 miles of line in 2 hours, a job which would take at least 10 ground patrolmen about two days, given favourable weather and ground conditions.

Chastang Inaugurated

The massive hydro-electric power station at Chastang, on the Dordogne River in central France, was officially inaugurated by the Electricite de France, last week. At this station the first of three 83,000 kW turbo-alternators has been in service for several months. It is built at the foot of a gravity arch dam banking up 180m cu metres of water in an artificial lake. The Chastang dam is the lowest of four which have been constructed on the Dordogne River. From the top dam, at Bort-les-Orgues, the total drop in the river is 350 metres.

Jordan Scheme

The Jordan Development Board last week had under consideration a large irrigation and hydro electric power scheme, under which a reservoir would be formed at Magarin on the Yarmuk River, near the Syrian frontier. From this a canal would lead westwards to Adda-

siya, falling 800 ft to operate a power station. From there an irrigation canal would be constructed down the Jordan valley to the Dead Sea, and another generating station would be built at the southern end. Estimated cost of the scheme is put at $38 million, which it is hoped will be provided by the United Nations Relief and Works Agency. Syrian consent to the project has already been given in principle, for part of the dam and reservoir would be in that country's territory. Syria, too, would take a portion of the electric power generated.

Dollar Loan for S.A.

It is reported from Johannesburg that the U.S. Export-Import Bank has decided to lend the Electricity Supply Commission of South Africa a sum of $20 million to finance the erection of a new power station to expand the production of uranium in South Africa. But the loan carries the proviso that the generating plant shall be ordered from the U.S., according to reports. It will be recalled that we noted in our May 15 issue that Dr. J. T. Hattingh, chairman of the Commission and Mr. G. R. D. Harding, general manager, were visiting this country and the U.S.A. in connection with a large loan to finance the construction of a power station at Wilge, near Witbank, in the Transvaal, which would have an ultimate capacity of 180 MW.

Plant for Johannesburg

Further details are now available of the orders valued at over £4 million for generating and boiler plant recently placed in this country by the Johannesburg City Council, to which we originally referred on June 5. The plant is for the new Kelvin power station, some 10 miles north-east of the city. The General Electric Co. is to supply three 30 MW, 11 kV, 3,000 r.p.m. turbo-alternators, while the boiler plant, which is being supplied by Babcock and Wilcox Ltd., consists of six stoker-fired units each of 187,500 lb/hr evaporative capacity at a pressure of 625 lb/sq in and a steam temperature of 865° F. This contract raises the total output of G.E.C. generating plant both commissioned and on order for the municipality to over 500 kW. The Babcock and Wilcox portion of the contract also covers the complete building steelwork (of all-welded construction), high and low pressure pipeworks and valves, and the turbine house cranes, its total value being in excess of £3 million. The consulting engineers are Merz and McLellan.

More Standards

The Indian Standards Institution has just published two more standards. The first is for ceiling fans, while the second refers to 3 ph. induction motors of over 1 h.p. with class "A" insulation for industrial use. The standard on ceiling fans prescribe six sizes varying from 36 to 84 inches, and maximum permissible speeds from 375 to 150 r.p.m. It covers design and general construction, finish, speed regulation, operation, tests, air delivery, etc. Electric fans are now being manufactured on a fairly extensive scale in India, and it is generally realised there that any existing prejudice against the indigenous product can be removed only if all the local manufacturers comply with definite standards of quality, performance, etc. We understand that a specification for table fans is under preparation, and preliminary work, such as collection of data, is in progress in respect of other types of fans. Here again, there is active co-operation by the Fan Makers' Association of India.

Delhi's Programme

A five-year development programme, involving an expenditure of Rs. 4.325 crores, is being carried out by the Delhi State Electricity Board, which took over in April, 1951, the Delhi Central Electric Power Authority Ltd. Under this, the installed capacity of generating plant of 38,200 kW at the end of 1951 is being raised to 55,600 kW by next December, to 70,600 kW in 1953 and to 83,600 kW by December, 1956. During 1954 and 1955 it is anticipated that there will be a slight reduction in the capacity of plant installed, due to the return of loaned plant to the Government and the shutting down of an old, uneconomical diesel station. In the matter of rural development, the Board is to tackle the question of electrification of two selected large villages as an experimental measure, and on the success there depends the extent to which supplies will be given to more villages.

Jap-German Agreement

The Fuji Electric Co. in Tokyo, a leading electric appliance manufacturer in Japan, has signed a technical and financial tie-up contract with the two Siemens electric concerns of West Germany. The contract was signed at the German firm in Erlangen, West Germany, President Kosuke Wada, of the Fuji Co., visiting West Germany for that purpose. The two firms had a similar contract before the war. Under the old contract, the German firm owned 30% of the stock of the Fuji Co.

£1m. for Transmission

A sum of £1,000,000 has been allocated by the New Zealand Cabinet for substation and transmission line development to improve the future power supply for North Auckland, it has been announced by the Minister of Labour, Mr. Sullivan, who is temporarily in charge of the State Hydro-Electric Department during Mr. Goosman's illness. The project involves the building of a new substation at Albany to replace the former Takapuna station; the reconstruction of the Henderson substation and the erection of transmission lines from Otahuhu to Henderson, and Henderson to Takapuna, Mr. Sullivan said.

PERSONALITIES

IN THE INDUSTRY

We hear of three changes in the transformer staff of Ferranti Ltd.: **Mr. G. B. Proctor,** B.SC. (Tech.), A.M.I.E.E., has resigned from his position of transformer sales manager; **Mr. R. M. Hobill** is now to assume responsibility for the transformer sales management, and thirdly, **Mr. H. G. Binns** has been appointed the transformer contracts manager.

C. C. Wakefield and Co. Ltd. announce the appointment of **Mr. L. G. Packham** as overseas general manager. In this capacity he succeeds **Mr. W. F. List,** who is now an assistant managing director. Mr. Packham, who is 44, was previously manager of Overseas Division (Branches) and has been with the company for 27 years.

Mr. Geo. C. Sofiano has been appointed sales agent for Yorkshire Switchgear and Engineering Co. Ltd. and their associated company, the Electro Mechanical Manufacturing Co. Ltd. He will operate from 63 Somerville Road, Sutton Coldfield.

In accordance with his intention announced at the recent annual general meeting (as reported in our May 29 issue), and in view of his advancing years, **Mr. H. Cecil Booth,** F.C.G.I., M.INST.C.E.—who is in his 81st year—now retires from the Board of the British Vacuum Cleaner and Engineering Co. Ltd., of which company he has been chairman for the past 40 years, and for many years was also managing director. The company last year celebrated the 50th anniversary of Mr. Booth's invention of the original vacuum cleaner, which was patented in 1901, and which gave rise to the foundation of the company. The Board have by unanimous resolution appointed **Mr. J. J. Hambidge** to be the new chairman. Mr Hambridge, who is 62 years of age, has been a director of the company since 1922 and has been actively associated with the conduct of the concern throughout the intervening period. In addition to his new duties as chairman, Mr. Hambidge will continue to act as senior joint managing director, which position he has held for some years.

Mr. H. Cecil Booth

Mr. J. J. Hambidge

Mr. A. S. Campbell, A.M.I.E.E., has been appointed acting electrical engineer and manager of the Electric Supply Department of Newcastle City Council, New South Wales, in succession to **Mr. N. E. Nash,** who is retiring. Mr. Campbell was previously the assistant electrical engineer and manager.

Manager of the Drawing Offices of the British Thomson-Houston Co. Ltd., Rugby, **Mr. P. E. Warden** has just completed fifty years service with that firm. Starting as an apprentice, he transferred to the Drawing Offices in 1908, becoming assistant manager in 1938 and manager in 1945—a position which he continues to hold.

From the Jackson Electric Stove Co. Ltd. we hear that **Mr. A. S. Oldhams,** A.M.I.E.E., has been appointed sales manager. Since joining the company in 1949 he has served as chief sales executive. Prior to going to Jackson's he was for many years with the Revo Electric Co. Ltd., latterly as engineer and manager of that company's London branch. During the last war he served as an electrical lieutenant in the R.N.V.R.

Mr. A. S. Oldhams

We learn that **Mr. S.W. Hutton,** sales manager of Progress Cables and Accessories Co. Ltd., has been appointed to the board of directors. Mr. Hutton has been associated with the company since its formation in 1932 and now becomes sales director.

Mr. F. R. Head, J.P., A.M.I.I.A., has been appointed manager of the new Lea Works, Luton, of George Kent Ltd. He was formerly production controller at the firm's Biscot Road Works in Luton.

Crompton Parkinson Ltd. wish to point out that the appointments referred to on page 1176 of our June 26 issue relate to personnel in their Supplies Division, and do not affect Branch Managership of the Plant Division, which remains unchanged in Birmingham and Cardiff.

Mr. T. Trubshaw has been appointed resident engineer and power station superintendent for the new Koolkham steam generating station of the Clarence River County Council, New South Wales. He was previously with the Townsville Regional Electricity Board, Queensland.

A well-known figure in Scottish electrical and motor trade circles, **Mr. W. Mason** of James Scott and Co. (Electrical Engineers) Ltd., Perth, has just received the crowning recognition of a lifetime's devotion to amateur boxing by being appointed referee and judge for the Olympic Games Boxing Events in Finland in July and August. He was nominated for the honour by the Scottish Amateur Boxing Association, and will be the only Scot on the referee's panel at Helsinki. Mr. Mason, by the way, is the Exide and Drydex representative in Perthshire for his company.

Mr. W. Mason

Following a recent meeting of the National Joint Industrial Council for the Electrical Cable Making Industry, at the Royal Station Hotel, York, the Cable Makers' Association gave a complimentary luncheon to **Mr. R. G. Evans** on his retirement from the Chairmanship of the Council. Mr. Evans, an official of the National Union of General and Municipal Workers, has been chairman of the council for the last seven years, and since 1936 a member representing the Trades Unions. In addition to taking the chair at the monthly meetings of the Council, he has also presided over the meeting of the two District Councils and of a number of Sub-Committees which have been set up during his term of office. **Sir John Dalton,** director of the C.M.A. and vice-chairman of the Council, presided at the luncheon and paid tribute to Mr. Evans's personal qualities and work, and made a presentation to him on behalf of his colleagues on the Council. Expressions of appreciation were also made on behalf of the constituent members of the Council.

Until recently chief buyer for Tilling Stevens Ltd. at Maidstone, **Mr. N. D. Miles,** M.P.O.A., has been appointed general supply manager for Remington Rand Ltd. Most of Mr. Miles's experience was gained with the British Thomson-Houston Co., with whom he started a five-year engineering apprenticeship in 1929. This was followed by various purchasing appointments, and from 1941 to 1945 he supervised all radar buying for B.T.H. at Leicester, afterwards joining Tilling Stevens.

Mr. L. A. C. Bartlett, A.M.I.Mech.E., commercial director of George Kent Ltd., left for India and Pakistan last weekend on a survey of future export possibilities. He will visit Bombay, Delhi, Lucknow and Karachi. On his return journey he will call at Istanbul, Turkey, and is expected back in this country on July 21.

Mr. A. A. Owen has relinquished his appointment as home sales manager for Smart and Brown (Engineers) Ltd., to join the board of E. J. Schofield and Co. Ltd., the northern manufacturers and distributors of electrical equipment.

The recommendation of the Belfast Corporation Electricity Committee that **Mr. R. P. Watson,** B.A., B.A.I., M.I.E.E., be appointed acting city electrical engineer and general manager with effect of October 1 next (as we noted last week) was not considered at the meeting of the Council last week. It was sent back for further consideration on the proposal of Councillor Geddis (chairman of the Electricity Committee). Members who tried to speak on the resolution were ruled out of order by the Lord Mayor, although they protested against that ruling, it is stated.

Mr. H. W. Bowen, O.B.E., M.I.Mech.E., M.I.P.E., has accepted the appointment of managing director of the Britannic Electric Cable and Construction Co. Ltd. Mr. Bowen recently resigned from his position of managing director of the E.M.I. Factories, Hayes, Middx., and took up his new appointment on July 7. He has had a distinguished engineering career and is well known on both sides of the Atlantic.

Mr. H. W. Bowen

Mr. F. L. Lawton, consulting engineer with the Saguenay Power Co., was elected president of the Canadian Electrical Association, at the annual convention at Banff Springs Hotel, Alberta, last week. Mr. Lawton has been connected with the hydro-electric power industry in Canada since 1925, when he joined the Quebec Development Co. He has held various positions with the Aluminium Co. of Canada and was associated with the design and construction of that company's 1,200,000 h.p. Shipshaw power development. He is also chairman of the Montreal branch of the Engineering Institute of Canada, and an active member of that organisation.

At the invitation of the British Iron and Steel Research Association, **Mr. W. F. Randall,** B.Sc., A.R.S.M., M.I.E.E., F.I.M., technical director, Telegraph Construction and Maintenance Co. Ltd., is now acting as chairman of the Conjoint Committee recently formed by that association and the Electrical Research Association to investigate problems associated with the properties and production of electrical sheet. Mr. Randall, by the way, returned recently from a business visit to the U.S.A. which had as its prime object the securing of supplies of beryllium copper.

The B.B.C. has announced that **Mr. H. Bishop,** C.B.E., F.C.G.I., B.Sc.(Eng.), M.I.E.E., M.I.Mech.E. F.I.R.E., has been appointed director of technical services in succession to **Sir Noel Ashbridge** who

is now retiring, as we noted in our May 29 issue.

Mr. R. T. B. Wynn, C.B.E., M.A., M.I.E.E., has been appointed chief engineer, and **Mr. F. C. McLean,** M.B.E., B.SC., M.I.E.E., becomes deputy

Mr. H. Bishop

Mr. R. T. B. Wynn

chief engineer. These appointments take effect from August 1. Mr. Bishop has been chief engineer to the B.B.C. since 1943. After serving with Marconi's Wireless Telegraph Co. he became senior superintendent engineer to the B.B.C. in 1923, and was promoted to assistant chief engineer in 1929. Mr. Wynn, who is to be the new chief engineer, has also been associated with broadcasting since its earliest days, joining the Marconi Co. in 1922. After four years at the Writtle experimental station, he became head of the B.B.C. engineering information department in 1926. In 1935 he was appointed senior superintendent engineer, and in 1943 was promoted to assistant chief engineer. Mr. McLean, now head of engineering projects group, has been with the B.B.C. since 1936, having earlier spent 11 years with Standard Telephones and Cables Ltd.

OBITUARY

The death occurred in Edinburgh on July 4 of **Mr. H. G. McHaffie,** M.I.E.E. After serving a mechanical engineering apprenticeship in Glasgow, he joined the British Thomson-Houston Co. Ltd., in London, and was one of the engineers who moved to Rugby when the company decided to start manufacture there. Subsequently he had considerable experience in various electrical power and lighting stations, including the Para Electric Railway and Lighting Co. Ltd., in Brazil. After returning from South America, he joined Balfour Beatty and Co. Ltd., and was with them for about 30 years until his retirement in 1945. For many years before he retired, he was chief electrical engineer for the numerous Balfour Beatty projects in Scotland.

Mr. Charles R. O. Shepperson, partner in the electrical contracting concern of Shepperson and Dooley, of Highgate, for nearly 40 years, died recently, aged 68.

Mr. C. E. Barnes, chief construction engineer of the briquette project at Morwell of the State Electricity Commission of Victoria, Australia, died as the result of a car accident on June 22.

Mr. John R. Struthers, M.I.E.E., formerly manager of the No. 3 (Sheffield) sub-area of the Yorkshire Electricity Board, died on July 2, in Belfast to where he retired after relinquishing his post with the Board on March 31, 1949. He was 69. Latterly he had been representative for the whole of Ireland for the Mitchell Engineering group. But it was chiefly by his association with Sheffield that he was well known throughout the industry—he became general manager of the city's electricity undertaking in May, 1935, and held that post till vesting day, during which time the undertaking progressed from one of medium size to the second largest municipal concern in the country. Prior to going to Sheffield in 1935, Mr. Struthers spent 13 years with the Belfast undertaking, for the latter six as deputy city electrical engineer. Educated at Stirling High School and Technical School, Alloa Technical School and the Royal Technical College, Glasgow, he served an apprenticeship in Stirling and with the British Electric Plant Co., Alloa. In 1906 he joined Glasgow Corporation Electricity Department and served in various posts, and in 1918 became clerk of works at Dalmarnock power station which was then being erected. When the station was opened in 1920 he was appointed deputy resident engineer.

Mr. John R. Struthers

Mr. M. Statter, who retired three years ago from his position as chief accountant of Loughborough Corporation electricity undertaking after 36 years' service, died on June 30, aged 66.

Mr. J. H. Thomas, M.C., M.I.E.E., who was with A. C. Cossor Ltd. between 1929 and 1939, firstly as general manager and latterly as managing director, died on July 8, aged 68. He was also, for a time, chairman of the Radio Manufacturers' Association.

Mr. A. J. Bagley, showroom manager of S. Smith and Sons (England) Ltd., died on July 5.

Mr. A. W. Steven, a former chairman of Allied Ironfounders Ltd., died recently, aged 84.

Mr. D. R. G. Mason, A.M.I.E.E., district engineer at Aberdare to the South Wales Electricity Board, died on July 7.

Wills.—**Mr. B. H. Middleton,** assistant engineer-in-charge at Littlebrook power station, left £1,944 gross (£1,878 net value.)

Major Stanley M. Mohr, O.B.E., M.C., M.I.E.E., managing director of the Micanite and Insulators Co. Ltd., and of the other concerns left £36,350 gross (£23,034 net value). (Duty paid £3,708.)

Mr. H. Dawson Roberts, commercial manager to the affiliated manufacturers' association of Cable Makers' Association, left £7,887 gross (£6,039 net value).

Railway Electrification Progress

Southern Region (B.R.) to convert to Standard Frequency

A LARGE part of the Southern Region's electrified suburban system has, since its inception, been supplied with primary power at a frequency of 25 c/s. This frequency was originally adopted in 1915 due to the better performance in those days of 25 c/s rotary converters. The supply was transmitted to the manually operated converter substations at 11 kV over a cable network. The Western suburban section used the railway's power station at Durnsford Road, Wimbledon, as a source of supply, while the Central and Eastern suburban sections drew power from 25 c/s plant at Deptford power station, which is now under the ownership of the B.E.A.

With the advent of the mercury arc rectifier, the restriction of supply frequency no longer applies, and as the plant both at Durnsford Road and at Deptford is nearing the end of its useful life, the time has come to put into operation the conversion scheme from 25 to 50 c/s.

Scope of the Scheme

All power will be drawn from the Grid at 50 c/s and will feed 72 remotely controlled substations. The total capacity of the mercury arc rectifiers to be installed in these substations will exceed 300 MW. For switching and control purposes, supplies will also be fed to three remotely controlled switching stations and 67 remotely controlled track paralleling huts. The distribution system coupling the substations and the switching station with the Grid will comprise some 300 feeder miles of new 33 kV oil-filled cable. Protection and control will be by pilot cables.

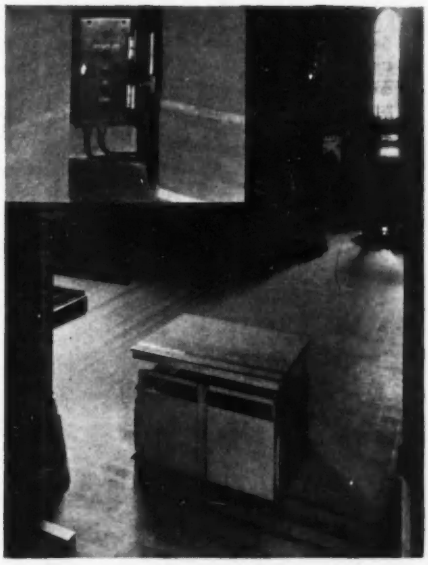
Orders for equipment were placed during the year and, owing to the increased power which will be made available, it is proposed to augment the train service by increasing the existing trains from eight coaches to ten. The first stage, which it is hoped to bring into operation in 1954, provides for ten-car trains running on the routes between Charing Cross and Orpington.

Contracts have been placed as follows: The high-voltage switchgear will be supplied by the General Electric Company and the British Thomson-Houston Co.; rectifier equipment is to be manufactured by three firms—Hackbridge and Hewittic Electric Co., G.E.C. and B.T.H.; d.c. switchgear will come from B.T.H. and Bertram Thomas Engineers Ltd.; and high-voltage and pilot cables from Pirelli-General Cable Works.

HIDING A CATHEDRAL LIFT

ELECTRICAL equipment in churches should be, above all, unobtrusive, and a lift presented this week to Liverpool Cathedral meets this criterion in an uncommon way. 150 sq ft of cathedral floor, weighing nearly four tons, is raised some 15 ft above floor level, yet when the lift is not in use the only indication of its presence is a rectangular steel edge in the floor.

Designed by the Express Lift Co. Ltd., the lift, which is hydraulically operated, is to be used to convey chairs to the cathedral direct from the store below. Control is effected from a panel which, as shown in the inset to the illustration, is located inconspicuously between two buttresses of the main pillars. A warning light indicates that the car has been filled with chairs from the store, and the operator in the cathedral is then able to raise the lift when the immediate area is clear of people. All wiring to the panel is concealed behind pointing in one of the pillars.



The lift, and (inset) control panel

The BUYER'S *Column*

Flame Failure Protection

THE protection of boiler and heating installations in the event of a failure of flame ignition or the extinguishing of a burner during operation is a matter of vital importance. Photo-electric cells have been used for detection purposes for some time. A new development introduced by the RHEOSTATIC CO. LTD., Slough, Bucks, gives protection over and above that normally attained. Apart from stopping the oil burner if the flame is not established during the starting operation, or if the flame goes out during a normal run, the equipment also shuts down the burner if the photo-electric cell or the amplifying valve fails; if one of the electrical connections breaks or is otherwise open-circuited; if a low resistance path develops across the photo-electric cell terminals, or if a short-circuit occurs. This equipment, known as the "Satchwell" type PER photo-electric device, is intended to supplement the "CM" and "B" flue installations. A full description is given in List No. 116, available from the company.

Cooking Equipment

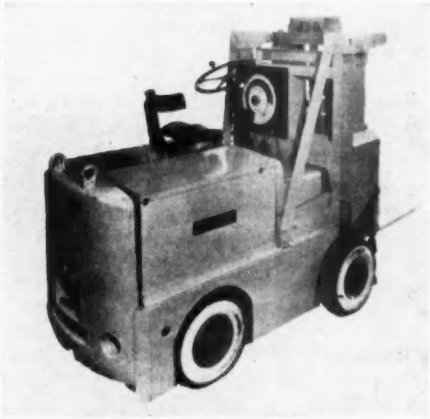
THE three grillers illustrated are part of the range of Creda heavy duty cooking equipment made by the SIMPLEX ELECTRIC CO. LTD., Oldbury, Birmingham. They are of modern design and are made of heavy gauge sheet steel with cast-iron frames. Efficient lagging prevents heat losses. They are supplied with or without stands and are finished in silver-grey mottled vitreous enamel, with blue mottled vitreous enamel interiors. Fuses are fitted in the element and pilot light circuits and are accessible from the front if necessary. Special care to avoid overheating has been taken in the design of the drop down handle on the grid tray. Switch positions are as follows: "High," all elements full on; "Med," half elements full on; "Low," all elements at quarter heat. The equipment includes a strong grid shelf, drip pan and a loose crown plate for easy cleaning. The smallest model has a grilling area of 16 in. by 14 in. with a 3·5 kW loading; the intermediate size has a grilling area of 22 in. by 14 in. with a loading of 5·25 kW; and the largest has an area of 30 in. by 16 in. and is loaded at 7 kW.

The range of Creda heavy duty grillers

We have also been asked by Simplex Electric to point out that the description of the R306 Creda domestic cooker given in our issue of June 26 is not strictly adequate. The two-tone ivory vitreous enamel version, selling at a list price of £25 11s. 6d., is fitted with Credastat oven control, Simmerstat controlled 8 in. boiling plate, and grill boiler. The silver-grey vitreous enamel finish version, listed at £22 13s., has three-heat oven control and three-heat control of 8 in. boiling plate and grill boiler.

Weighing While Handling

BY an ingenious application of the beam weighing system, the "Stacatruc" fork lift truck can now weigh as it lifts. Once a load has been picked up by the forks of the machine, the mere pressure of a lever is enough to bring the weighing mechanism into action and a direct reading of the load weight is given. Releasing the lever provides a full locking function so that the mechanism will stand up to the hard wear associated with such handling equipment.

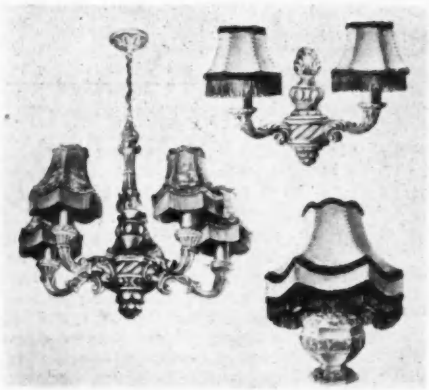


A Stacatruc complete with weighing gear

This device can lead both to a considerable speeding up of goods transit, as two independent operations have now been combined, and to a great saving in labour. The device—the "Wheeler-weigh"—has been developed by I.T.D. LTD. in conjunction with AUSTIN CROMPTON PARKINSON ELECTRIC VEHICLES LTD. Inquiries should be made to I.T.D. Ltd., at 95-99 Ladbroke Grove, London W.11.

"Dexray" Lighting Fittings

THE accompanying illustration shows some of the range of new lighting fittings manufactured by "Dexray" and marketed by BARRIES ELECTRICAL AGENCIES LTD., of King Street, Brighton 1. These fittings were prominently featured at this year's British Industries Fair, and



Some of the "Dexray" fittings range

are particularly suited for use in rooms where period furniture and decorations are required. As can be seen, they cover ceiling mounted, wall mounted or table lamps. Other fittings in the range are suitable for more modernistic environments.

New Osram 200/260 V Infra-Red Lamp

A NEW Osram infra-red lamp with an internal reflector has been introduced. This is for use on normal mains voltages between 200 and 260 V. Rated at 250 W, the new lamp is similar to the 100/130 V Osram infra-red reflector lamp already widely used in industry for process heating and paint drying. Internal silvering on the inside of part of the bulb provides the lamp with its own reflector which projects the heat in the required direction, the end of the bulb being lightly obscured to diffuse the heat. The cap is attached to the bulb by mechanical means to ensure that it is not loosened under arduous service conditions.

The lamp, which has many agricultural applications, is particularly valuable for pig farrowing. Warming piglets by this means after farrowing not only eliminates mortality losses, but also promotes more rapid fattening, since the young pigs conserve energy which would otherwise be consumed in keeping themselves warm. The GENERAL ELECTRIC CO.'s P.H. 6643 pig farrowing unit has been specially designed for use with Osram infra-red 200/260 V reflector lamps.

Pressure Cooking

THE "New Coronation" pressure cooker, available from METWAY ELECTRICAL INDUSTRIES LTD., King Street, Brighton, has a ground solid base, suitable for electrical hotplates, and is fitted with a quick release pressure and vacuum valve. The lid is ground in with a cam-locking device to retain pressure. Safety is assured by a fusible plug. Supplied complete with instructions, the cooker costs 99s. 6d.

TRADE PUBLICATIONS

BEHIND THE SYMBOL.—This is the title of a new leaflet describing "behind the scenes" work at the Trafford Park, Manchester, factory of the Lancashire Dynamo Group. The company concerned is Lancashire Dynamo and Crypto (Mfg.) Ltd.

MICRO-SWITCHES.—Catalogue No. 50, just received from Burgess Products Co. Ltd., Dukes Way, Team Valley, Gateshead 11, describes in full detail the range of micro-switches produced by this organisation.

STEAM GENERATORS.—A well-illustrated brochure, produced by International Combustion Ltd., 19 Woburn Place, W.C.1, gives a description of the boiler and coal handling plant as supplied to the Poole Power Station of the B.E.A.

LIGHTING FITTINGS.—Atlas lighting fittings of all types, suitable for use with tungsten filament lamps, are detailed and illustrated in handbook reference AL/114, available from Thorn Electrical Industries Ltd., 105-109 Judd St., London W.C.1.

ELECTRICAL ACCESSORIES.—Sloan Electrical Co. Ltd., of 31-33 Bondway, Vauxhall, S.W.8, have now issued a new Reyrolle accessories and switchgear catalogue. This contains details of industrial and domestic plugs and sockets, switch-fuse and plug units and so forth. The large Reyrolles switchgear for higher voltages is of course not included.

LOUDSPEAKER UNITS.—The new range of Rola and Celestion loudspeakers and multi-range transformers stocked by Truvox Ltd., Truvox House, Exhibition Grounds, Wembley, Middlesex, and distributed to wholesalers are described in leaflet SH.285.

ULTRASONIC SOLDERING.—The application of ultrasonic technique to soldering makes possible the tinning of aluminium and other light metals without the use of flux. Full information on this subject is given in a new publication, "Ultrasonic Soldering Equipment," issued by Mullard Ltd., Century House, Shaftesbury Avenue, London W.C.2.

HARD-WEARING PLASTICS.—The use of laminated plastics as decorative and hard-wearing finishes is described in a booklet, "Warerite Laminated Plastics—in Crews' Quarters," produced by Warerite Ltd., 18 Grosvenor Gardens, London S.W.1. This deals with the use of these materials on shipboard.

The WEEK in NEWS

Anglo-French Committee Recommends Channel Link

THE Joint Technical Committee on the proposal to link France with England by submarine cable has reported favourably on the scheme. This was announced in the House this week. The British Electricity Authority and Electricité de France have agreed broad technical details. although the proposal will still require political agreement between the two countries.

Much experimental work remains to be done before the design of cable, and particularly the accessories, can be approved. A sum of some £250,000 has been set aside to cover this work during the next two years. The total estimated cost of the scheme is expected to be in the region of £4½m. excluding certain works on land at both ends of the cable. This will be shared by the B.E.A. and Electricité de France.

The purpose of the link is to take advantage of the different peak hours of the two countries and in consequence the cables will be used for load transfers in both directions up to the maximum rating of 100 MW. The transmission voltage will be 132 kV alternating current and it is suggested by METEOR that probably four single-core cables will be used, one being a spare in case of breakdown. With two years devoted to the development work, it seems unlikely that the scheme can be in operation before 1956.

ELECTRICAL GOODS ON INDIAN O.G.L.

THE Government of India has recently issued a lengthy list of commodities which may be imported under Open General Licence. This list includes a number of electrical items and goods having electrical applications. Imports will be allowed from any country except South Africa provided they were not manufactured in South Africa and they are shipped before March 31 next year. One of the most important items listed is probably the electrical generator. These may be with or without prime movers and included are switchgear, switchboard, indicating and recording instruments, but transformers are excluded. In cases where the prime mover is an internal combustion engine, it should not be less than 25 b.h.p. Steam raising equipment and boiler feed equipment also come within this category. Spare parts of power drive pumps are also listed as also are h.t. insulators, paper insulated power cables and flexible metallic tubes for transmission systems.

Copper for electrolytic wire bars and aluminium for conductors, zinc electrodes and welding electrodes have also been listed. Finally, there is a total of 27 commodities under the heading of electrical instruments, apparatus and appliances for use in laboratories.

COPPER PRICE UP AGAIN

THE price of electrolytic copper has been increased again from £281 to £287 per ton as from July 5, it was announced last week by the Ministry of Materials. Discounts and premiums remain unchanged. The Ministry of Supply is to make corresponding adjustments in the controlled prices of scrap and secondary metal.

In its announcement, the Ministry states that this latest increase of £6 follows further negotiations with Commonwealth suppliers. It adds that a meeting has now been arranged between the Ministry and suppliers to discuss future pricing. Some importance may be attached to this further meeting as an effort will be made to achieve a long-term understanding on prices in place of the present short-term arrangements which necessitate almost continuous contact with producers. In the last few weeks copper prices have risen £56 per ton.

The First Half-Century

Opening proceedings at the dinner which brought to an end the International Tramways and Light Railways Congress had been conducted in English (of a sort) but Mr. T. P. O'Connor broke that tradition by proposing "The Ladies" in French. Thenceforth the polyglot floodgates were opened, and we had a whole series of speeches in French, German and American. Two German delegates in succession replied for "The Ladies," the latter of the two relating, so far as I could gather, incidents of his reception at home after just such an evening as this. The ladies, by the way, were dining by themselves in another room, in accordance with a German custom, but they seem to have grown tired of each other s society and were peeping through the curtains during the later speeches.—*From our issue of July* 10, 1902.

E.S.M.A ask for Electric Signs Again

ENCOURAGED by the relaxation of the ban on electric signs during the final month of last winter, the Electrical Sign Manufacturers' Association have asked the Minister of Fuel and Power to permit the unrestricted use of electric signs throughout the coming winter months. This latest appeal to the Minister is based on statements made by members of the B.E.A. at the recent Electrical Power Convention at Bournemouth. Remarks were passed on that occasion, E.S.M.A. points out, to the effect that restrictions on the use of electricity will not be necessary in future, and that the position has been reached where a campaign to develop the use of electricity could go ahead without endangering industry.

The Association's secretary, Mr. B. Moss, states that coming from authoritative sources, those remarks would not have been made if they were not supported by facts. Consequently, E.S.M.A. feel confident that their request will be granted.

It will be recalled that last winter the use of electric signs was restricted to between 7 p.m. and 7 a.m. except on Saturdays and Sundays. E.S.M.A. suggested during the winter that the restriction should be relaxed and although this request was refused at the time, the Minister decided on an identical relaxation only a fortnight later.

Electrical Grants to the Colonies

THE annual return of schemes made under the Colonial Development and Welfare Acts was issued by the Secretary of State for the Colonies and published by H.M.S.O. last week. Last year's total of £14,470,682 was the largest annual sum paid out in the six years under review. Among major electrical projects included in the review is the grant of £715,000 for Mauritius towards the cost of hydro-electric works. We note a small item which might cause some wonder, namely the £50 concerning the visit to St. Lucia (West Indies) of Dr. Gunnar Bodvarrson of the Geothermal Dept., of Iceland's State Electricity Authority. He was investigating the harnessing of energy derived from volcanic fumaroles for the generation of electricity.

CLAIM FOR PRE-VESTING ASSETS AT CARLISLE

THE B.E.A. is claiming assets held by Carlisle's electricity undertaking before vesting day. After obtaining further legal advice, the City Council has decided to oppose the claim in the High Court. The B.E.A. contends that over the past 30 years the Council has charged to the revenue account of its electricity department for income tax payable on the department's profits, without setting against that liability income tax deducted from interest and other annual payments by the undertaking. The B.E.A. maintains that these accumulated sums should have been transferred by the Council on vesting day. On the other hand, the Council has been told it has acted quite legally in the matter and the claim is to be contested. The dispute will be determined in the High Court.

New Lanterns Used at Bracknell

EMPLOYMENT of the new Siemens sealed drum refractor lanterns is probably the outstanding feature of the recently installed Class A sodium lighting which has been brought into operation in the new town of Bracknell, Berkshire. The novelty of this lantern is that the vacuum jacket of the sodium lamp is sealed to the drum refractor assembly by a heat-resisting rubber gasket so that it is dustproof and watertight. The conical end cap can be removed to give access to the lamp which may be removed without breaking the seals. This reduces maintenance to a minimum, and normally the only cleaning required is that of the exterior of the drum, and this can be done when the lamp is changed. In practice little dirt accumulates on the glassware and rain has a marked cleaning effect.

Our accompanying illustration shows the most effective road surface brightness which the installation achieves, even in its naturally dark surroundings. The daylight appearance of these lanterns is equally pleasant. All the lanterns, control gear and lamps were supplied by Siemens Electric Lamps and Supplies Ltd., and the columns by Stewarts and Lloyds Ltd.

Sealed drum refractor lanterns used in street lighting at Bracknell

1952-53 Plans for Rural Schemes in S.W.

A TOTAL OF 5,000 RURAL PREMISES STILL UNCONNECTED

RURAL development plans in the South Western Electricity Board's area for the year ending next March have been made known by the chairman, Mr. S. F. Steward, in a letter to Truro's M.P., Mr. G. Wilson. It is intended to take supplies of electricity to a further 1,868 farms and 8,049 cottages and other country premises under the 1952-53 programme. This announcement was timely, coming immediately after the chairman's review of the 1951-52 programme, when it was disclosed that for the first time on record over 1,100 farms had been connected in one year and over 8,100 rural premises had received a supply of electricity. Mr. Steward also told consumers recently that there was still a total of 50,000 rural premises unconnected.

Of the regional total in the current year's programme, schemes will provide electricity to 2,682 premises in Devon, 2,217 in Cornwall, and 2,193 in the Taunton sub-area. Among principle developments are plans for 183 dwellings at Barnstaple, 429 at Bridgwater, 250 at Crewkerne, 379 in the Exe Valley, 166 at Minehead and 393 at Taunton. Mr. Steward has explained that the programme covered work at all stages from schemes put in hand last year to those on which only preliminary work could start this year.

New Irish Factory Competes with Britain

SOME time ago it was reported in these columns that a new factory was being built in Waterford for the Ateliers de Constructions Electriques de Charleroi. We heard last week that the first consignment from that factory, comprising some 250 transformers to be used in rural electrification projects in that county and in neighbouring Wexford, have been supplied to the Irish Electricity Supply Board. The new factory now employs some 70 workers. It does, of course, represent strong competition to British exporters, who are likely to be affected still more when the company puts a range of low h.p. motors on the market shortly. Prestige of British assembled equipment does, however, remain high.

A small corner of Electricity Farm (left), E.D.A. and S. Western Electricity Board's exhibit at the Royal Show, Newton Abbot this month. A local blacksmith took over the demonstration of the fully equipped modern smithy. On the right is a small section of the crowd which bade farewell to London's trams last weekend

OFFICIAL PUBLICATIONS

HEATING APPLIANCES (Fireguards) BILL H.M.S.O. 3d.

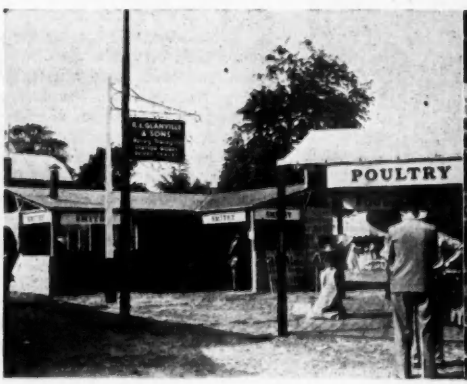
DISPOSAL OF UNCOLLECTED GOODS BILL (as amended) H.M.S.O. 6d.

RADIO INDUSTRY COUNCIL. Specifications RIC/151, Switches, Dolley operated; RIC/154, Switches, wafer, rotary; RIC/251, Valveholders, electronic receiver types.

SHEFFIELD ALARMED AT DAMAGE TO LAMPS

MALICIOUS damaging of electric street lamps in Sheffield increased during the year ended March 31 last, according to the annual report of Mr. C. J. Chisholm, the Corporation lighting engineer. Damage to gas lamps decreased during the period, but no explanation for this differentiation is given. In the year 2,278 electric lamps were broken and a further 170 stolen, but as the Corporation had 16,142 electric lamps and 12,188 gas lamps throughout the city's 711 miles of lighted streets at March 31 last, it will be seen that the task of supervision is no easy one.

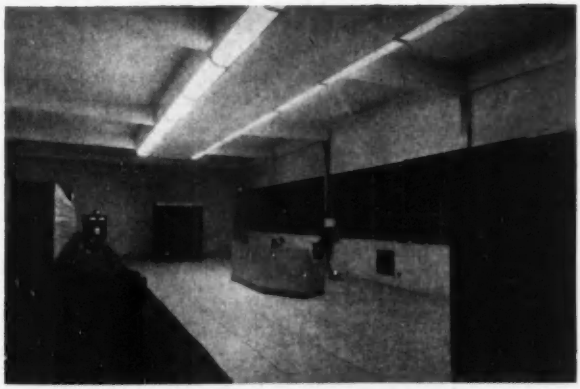
In all 29,307 electric lamps were used during the period, representing an average of 1·815 lamps per lighting point per annum. The department still maintains its laboratory and test rooms for testing gas mantles and electric lamps, and of the latter 328 were rejected and returned to the makers for replacement. Incidentally, the department is responsible for buying all the Corporation's electric lamps—the total was nearly 71,000 during the year.



NEW LIGHTING SCHEMES IN RAYON FACTORY

RECENT lighting improvements at the Aintree rayon factory of British Enka Ltd. were carried out to plans by engineers of the British Thomson-Houston Co. Ltd. The new schemes involve the control room and works roadways. In the former (as can be seen in our accompanying illustration), 16 specially made "Perspex" fluorescent fittings, each housing three tubes, have been mounted on both sides of a central false panel running the length of the ceiling.

Outside, on the roadways, the entrance and gatehouse have been illuminated by four fluorescent lanterns of the type used for main roads. Each accommodates three 80W 5ft tubes and have been mounted on Stanton columns. Lighting for the main roadways has been provided by 36 "Perspex" fluorescent lanterns housing two 40W 2ft lamps. The various installations were carried out by E.P.I. Ltd., W. J. Furse and Co. Ltd. and the N. Midland Engineering Co.



New specially made fluorescent fittings, supplied by B.T.H., illuminate the control room at British Enka's rayon factory

Electric Trolley Loco for Lancs Colliery

MOST recent experiment at Sandhole Colliery, Walkden (near Manchester), where numerous experiments have taken place in the past, is the order placed recently for an electric trolley locomotive. This colliery was one of the first in the country to operate diesel locomotives which are now used underground, and experiments in the use of fluorescent lighting were also carried out there. The Electricity Regulations under the Coal Mines Act of 1911 at present prohibit the use of trolley locos except with the permission of the Chief Inspector of Mines. This is because the exposed overhead wires are considered too dangerous for operation under British conditions. The Chief Inspector's consent has, however, been obtained for the trial and the necessary equipment has been ordered.

RADIO AND TV SALES STILL FALLING

AVERAGE number of radio and TV sets sold per shop continued to fall during April, according to the latest R.T.R.A. index for that month, just issued. The decline was particularly marked in regard to TV sets, the April figure of 3·72 showing a drop of 4·57 over that of the previous month. Sales of radio sets fell from 6·73 in March to 5·44 in April. A fall is of course to be expected towards the middle of the year, and restrictions on hire-purchase arrangements may also have been influential. When comparing the index with figures for April 1951 (17·26 radio sets and 15·62 TV sets) the Association states that the 1951 figures were influenced by extensive "beat-the-Budget" buying.

E.I.B.A. GOLF DATES

Further to our announcement of the E.I.B.A.'s National Golf Finals last week, we now note the dates of three Area Finals. In the East Midlands they will take place at the Notts Golf Club, Hollinwell (nr. Mansfield) on July 22, and those in the London section at St. George's Hill Golf Club, Weybridge, on July 24. The Eastern Area Finals will be on July 23 at the John o' Gaunts Golf Club, Sandy, Beds.

S. Wales Tariffs to be Reviewed

FOLLOWING the introduction of new electricity charges in S. Wales, the Consultative Council, at their meeting last week, asked the Board to review the tariff not later than December. The board has previously undertaken to review the new tariff carefully from time to time. The Council also considered a reply from the Board concerning a complaint that the £204,000 allocated to the Area for rural development was inadequate.

Much work had been done in recent years on trunk mains, the Board stated, and as a result they would be able to go ahead with detailed development at a faster rate. Previously they had been hampered by an insufficiency of existing main feeds into rural areas. Stages four and five of the rural development programme were being prepared, each of which was estimated to cost £170,000. This compared with estimated cost of £100,000 for the first three stages. The Eastern Board, one of the largest agricultural areas, had an allocation of £312,000, against which S. Wales' allocation of £204,000 appeared reasonable.

The Board emphasised that figures related to detailed development of rural areas and took no account of the very considerable expenditure on grid lines and other h.v. mains, nor of preliminary work.

NEWS IN BRIEF

The next Lyons International Fair is to take place between April 11 and 20, 1953.

The 28th annual conference of E.A.W. will take place on April 15 next year. Annual meeting and luncheon will be at Connaught Rooms, London.

The President of the Board of Trade has prohibited the import of Coronation Souvenirs from foreign countries.

The B.B.C. hopes to start daily test transmissions on medium power from the new TV station at Wenvoe on July 15.

The Great German Radio and TV Exhibition at Dusseldorf has been postponed to February 27, 1953, because N.W. German Radio is unable to provide TV programmes throughout Western Germany until early 1953. Details of advertising in the catalogue remain unchanged.

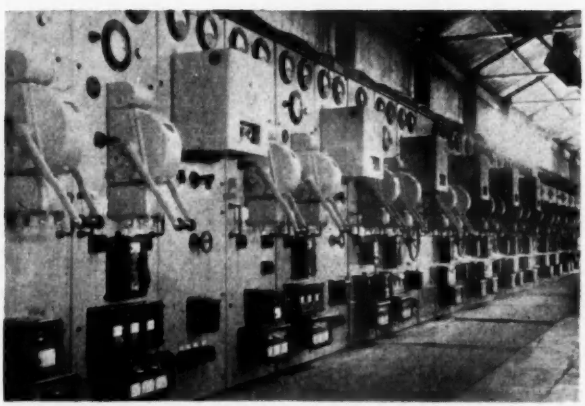
A one-day conference on "Factors in Plant Development," arranged by the Textile Institute, will be held at Lesser Free Trade Hall, Manchester, on September 24. This follows a series of meetings on problems of improving the efficiency of machinery in the textile industry.

The G.P.O.'s cable ship *Monarch* which recently returned to this country from Florida, is refilling her cable tanks with about 1,300 miles of cable in preparation for a job of importance to telegraph communication between this country and North America and also Australia, New Zealand, the West Indies and the Far East.

Middlesbrough Corporation has approved in principle the formation of a direct consultative and minor maintenance service for the Council's electrical works. In the past much of this work has been done by the N.E. Electricity Board.

BLACKPOOL REPLIES TO CHALLENGERS

ANYONE asked about illumination schemes at seaside resorts up to a short time ago would immediately have thought of Blackpool. The Lancashire resort's supremacy in that field has been seriously challenged in recent years, notable among the contenders being, perhaps, Ramsgate, whose 1952 installations we referred to three weeks ago. Blackpool, however, claims this year's show, their 20th incidentally, to be the biggest and best produced. It involves materials valued at over £300,000 and this scheme is to cost some £70,000. The lights will be seen this year for seven weeks—from September 4 to October 20. New tableaux have been designed and new features produced in an effort to keep the six miles of promenade the best in the country.



Part of the equipment installed by Crompton Parkinson in Jinia power station as part of Uganda's Owen Falls H.-E. scheme

Lady Railing receives a bouquet at the 26th annual G.E.C. Championship Sports which took place at the company's Witton works last Saturday. Behind her in our illustration are Sir Harry Railing, chairman; Dr. C. C. Garrard, director at Witton; Mr. J. J. Gracie, general manager of the engineering works, and Mrs. Gracie

Owen Falls' First Turbine Next Year

THE first turbine of the Owen Falls Hydro-Electric power station, now under construction for the Uganda Electricity Board is expected to be in operation next year. During the intervening period, however, the Board has increased Uganda's supply of electricity by means of diesel generating stations. The installation of these stations to replace the old small capacity steam station was recommended by the Board's present chairman, Mr. C. R. Westlake in his report on development of electricity supplies in 1947. The three diesel stations now operating are at Kampala, Jinja and Mbale, but they are to be shut down when the Owen Falls station is commissioned. The new water turbine sets will generate at 11 kV.

Crompton Parkinson, Ltd., supplied the main switchgear for the diesel stations, the power and control circuit cables and lighting fittings and lamps. The British Electric Transformer Co. Ltd., supplied the four 1,200 kVA transformers for Kampala and the two 5,000 kVA three-winding transformers for Jinja.

Questions in Parliament . . .

Using Low Temperature Heat

Asked what success had attended the experiment at Battersea power station in the utilisation of low temperature heat, Mr. G. Lloyd said on Monday that the experiment had proved technically successful but it would take some time to weigh up its economic merits. Discussions were taking place with a view to promoting similar schemes elsewhere.

E.L.M.A.Comply with Monopolies Report

The Minister of Supply assured the House on Monday that E.L.M.A. had made the necessary changes in their rules and methods to comply with the recommendations of the Monopolies Commission. Lt.-Col. Lipton asked whether the changes would mean cheaper and better lamps, as that was the real test. The Minister replied that that was a different matter.

Consumption and Demand

Replying to questions on consumption and demand of electricity, the Minister of Fuel and Power said the present generating capacity of B.E.A. power stations was not ample to meet foreseeable demand next winter. He also stated that there had been a 1.7% increase in consumption in the first half 1952 over the same period last year, and an increase of 15.8% over consumption in the first six months of 1950.

Private Generators

Mr. G. Nabarro asked last week what direction the Minister proposed to issue for the guidance of owners of private generators for the sets' maximum utilisation during the coming winter. The Minister said that guidance on the subject would be given in the report of the sub-committee which has been considering load spreading for next winter.

Industrial Application of Research

Questions were asked last week concerning the steps being taken to enable the results of scientific research to be brought to the attention of industries which could, to advantage, make use of them. The Parliamentary Secretary to the Ministry of Works said Government departments were paying particular attention to the matter and industries' research associations were also making special efforts. While it was probably true that industry was not making full use of scientific developments, all Government departments, including the Ministry of Fuel and Power, had their advisory services. In addition, there were technical information officers, H.M.S.O. reports, abstracts and articles, and lectures.

Hire Purchase Restrictions

In a debate on the adjournment last Thursday, Mr. Stephen McAdden (Southend, East) suggested that the effects of the Hire Purchase and Credit Sales Agreements (Control) Order was having farther reaching effects than had been originally intended. He spoke of a serious fall in radio, radiogram and television sales, and argued that if the home trade in these items were allowed to fall too far, great hardships must result to a valuable industry.

Mr. McAdden went on to mention that there had also been a sharp fall in supplies of electrical appliances. For vacuum cleaners, for instance, for the first quarter of this year the home market output was 115,000 compared with 204,900 for the same period of 1951. Washing machines were another item in which a serious reduction was apparent.

In reply, Mr. Henry Strauss (Parliamentary Secretary to the Board of Trade) emphasised that the Order under consideration imposed no physical controls; it was one of a series of monetary measures restricting credit. The time had not yet arrived when restrictions on credit were no longer necessary. Further, if there were falls in sales on the home market, the surplus capacity could in most cases be used in more important work, or the labour absorbed elsewhere. It was noteworthy that exports of radio sets were increasing.

He suggested that it was dangerous to ascribe a fall in sales to the effects of purchase tax or hire purchase restrictions. Electric cookers were liable to neither, yet production figures had fallen sharply. However, since it was no part of the Government's purpose to close down an industry through operation of the Order, the Parliamentary Secretary to the Ministry of Supply was to meet representatives of the British Radio Equipment Manufacturers' Association to discuss the matter.

Load Spreading next Winter

Sir Walter Monckton on Tuesday announced load spreading arrangements proposed for the 1952-53 winter. It was recommended that between November 1 and January 31 industrial and large commercial consumers should take steps to reduce their demand at peak hours by at least 10%. The Regional Boards would have discretion to vary this percentage. It is understood that this recommendation is based on B.E.A. estimates of average cold spell peak demand of 14,900 MW as against an expected plant output capacity of 13,280 MW. Domestic consumers are also urged to economise during peak hours.

TV Links

Mr. D. Gammans stated on Friday that the cost per mile for TV by co-axial cable from Manchester to Kirk o' Shotts was £2,424; the distance being 248 miles. The B.B.C. was to pay the Post Office an annual rental, provisionally estimated at £100,000. Regarding the London to Manchester service (247 miles) the cost per mile was said to be £4,482 and the annual rental £90,000.

Electric Supply News . . .

Caithness

Of the 6,300 actual or potential consumers in the county when the North of Scotland Hydro Electric Board took over in 1948, 67% were already connected up, stated Mr. T. Johnston, chairman of the Board, at the inauguration last week of the supply system up to John o' Groats. When the distribution contracts already placed were completed in the next two years, the figure would be increased to 80%, he added. Tariffs in Wick and Thurso had been reduced by 57%. At the ceremony, 17 miles of h.v. line and 6 miles of l.v. line were energised, supplying between 50 and 60 households in the John o' Groats district immediately. That number will be increased until the network serves about 250 consumers.

Durham

The Durham County Borough's Association has been in negotiation with the North-Eastern Electricity Board regarding the latter's terms for installing cables for supplying electricity to new housing estates. It is reported that after a measure of agreement had been reached, the Board proposed the introduction of a clause that where an access road more than 20 ft. long has to be built to a substation, the local authority should bear the cost of the work over the 20 ft. This condition is being resisted. Sunderland Corporation has asked the Electricity Board to install electricity in houses at present served only by gas and the Board offered to carry out the work, provided the Council reinstated the trenches after the cables had been laid. Durham County Boroughs' Association has recommended that these proposals should also be rejected.

Glamorgan

Objections to the proposal of the B.E.A. to erect a new power station in the Machen area, near the Glamorgan boundary, were voiced at last week's meeting of the Glamorgan County Council Planning Committee. The County Planning Officer, Mr. E. J. Powell, maintained that the project would destroy a most beautiful valley. He said the Monmouthshire Planning Committee had been notified of Glamorgan's views and formal objection would be lodged at the appropriate time. It was stated that the works would be situated wholly in the Monmouthshire area and not partly in Glamorgan as was first thought. But the effect on the landscape as seen from Glamorgan would be detrimental.

Lake District

At last week's meeting of the Lake District National Park Planning Board, it was reported that the board's representatives had been unable to agree with the North Western Electricity Board on the line to be taken by the overhead cable up Martindale near Ullswater. They had rejected the Minister's suggestion that both electricity and telephone lines be carried on the same poles, because the "cats' cradle" effect that would be necessary for safety would be more damaging from the amenity point of view than two sets of poles. Its cost, too, would be little less than that of putting the cables underground. The final decision now rests with the Minister of Fuel and Power, it was stated.

North-Eastern

The North-Eastern Electricity Board has applied to the Minister of Fuel and Power for permission to complete the changeover to the standard a.c. voltage in isolated areas of Newcastle, Gateshead, South Shields and Tynemouth.

LIGHTING SCHEMES

Earls Barton.—The Parish Council is considering a proposal to convert street lighting from gas to electricity.

Hastings.—The Highways and Works Committee recommends that consent be sought to the borrowing of £18,700 to convert the hand-operated street-light switches to automatic time switches.

Margate.—T.C. recommended to apply for consent to borrow £1,675 for improved lighting of Canterbury Road from Birchington Square to Broadley Avenue.

Port Glasgow.—T.C. has approved scheme for converting gas street lighting to electricity in the main thoroughfare at a cost of £9,500.

Potters Bar.—The U.D.C., which has approved a scheme for sodium lighting on the Great North Road to its boundary at Little Heath at a cost of £3,225, has asked whether Hatfield Rural Council would consider extending the scheme to include the whole of the built-up area, to a point beyond School Road, Little Heath. Hatfield Council is to consider the matter.

Radcliffe.—M.o.T. has approved scheme for improved lighting on Bury and Bolton Road at a cost of £2,600.

Reading.—Housing Committee proposes to carry out by direct labour a scheme for street lighting on Site No. 7 of the Bath Road housing estate, at a cost of £3,200.

Romford.—M.o.T. has approved the installation of Class "A" lighting in Mawney Road from Eastern Avenue to White Hart Lane.

Sheffield.—The question of providing sodium lighting in certain secondary roads is being considered, and as a first instalment the Watch Committee propose to use such equipment for 87 lamps on the Basegreen Estate.

Sunningdale.—The Parish Council has been told it would cost £1,431 to convert existing gas lighting to electricity, and with new posts £1,507. The Lighting Sub-Committee is to investigate.

Company Activities . . .

Broadcast Relay Service Ltd.

Group trading profit for 1951 is £1,611,747 (*£1,341,126*). After deducting depreciation, directors' fees, audit fee, interest, £450,000 (*£350,000*) to general contingencies reserve, and £496,637 (*£362,681*) to U.K. taxation, leaving a consolidated net profit of £541,837 (*£528,903*), of which £149,689 (*£181,394*) is the share of minority interests, £210,655 (*£198,398*) to subsidiary companies and £181,493 (*£149,111*) to Broadcast Relay Services. The final dividend is 8% tax free, making 16% tax free, and there is £377,241 (*£374,400*) carried forward. The company proposes to seek Treasury consent to a substantial issue of new permanent capital, it is stated, to repay bank borrowings and provide further funds for expansion of the group's activities, in the main overseas.

George Cohen, Sons and Co.

Combined group profit for the year to March 31, before taxation, is £1,825,770, an increase of £953,685 on the previous year's total. The final Ordinary of 18% (*15%*) raises the total to 26% (*23%*). After taxation of £1,111,500 (*£525,853*) the combined group profit is £714,270 (*£342,232*). The amount of the combined net profit attributable to the holding company is £704,019 (*£331,983*). After payment of dividends and the transfer to general reserve by the parent company of £250,000 (*£64,000*) and by subsidiaries of £220,000 (*£13,333*), there is £7,378 (*£303*) carried forward by the parent company and £109,303 (*£121,624*) by the subsidiaries.

E. K. Cole Ltd.

The full accounts show a consolidated trading profit for the year to March 31 last of £564,025 (*£514,740*) after writing off £4,500 balance on subsidiary goodwill. Added is £50,000 (*nil*) tax provision not now required. Employees' pensions, etc., takes £26,072 (*£21,722*), depreciation £54,067 (*£43,405*), loan stock interest £19,000 (*£8,901*), and taxation £304,000 (*£270,002*), etc., leaving a net profit of £209,215 (*£155,050*). Dividends absorb £49,987 (*£44,597*), to general reserve £50,000 (*£100,000*), employees' supplementary pensions reserve £10,000 (*£40,000*), leaving £229,672 (*£130,444*) carried forward.

Hackbridge and Hewittic Electric Co.

Consolidated trading profit for the year ended March 31 last is £466,959 (*£380,751*). The final dividend is 15% (*13%*) making 20% (*18%*). After providing for emoluments, depreciation, etc. £51,056 (*£41,881*), overseas tax £5,857 (*nil*) and U.K. tax £251,500 (*£196,150*), the net profit is £158,546 (*£142,720*) of which £5,096 (*£170*) relates to subsidiaries. To general reserve £75,000 (*£80,000*), directors' pensions £5,000 (*same*), and £53,066 (*£39,466*) is carried forward.

Simon-Carves Ltd.

For 1951 the group profit is £411,115 (*£524,255*) plus transfer from provision for retention charges on completed contracts £180,978 (*deduction £138,082*), and dividends and interest of £20,539 (*£15,039*). Taxation absorbs £263,575 (*£234,648*). The final dividend is 5%, making 17½% for the year on reorganised capital (*30% on old capital*).

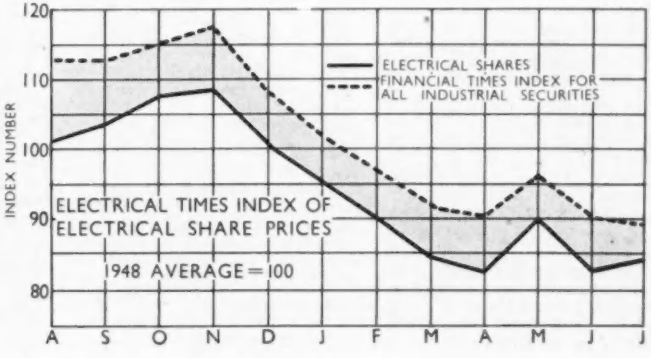
Ward and Goldstone

For the year to March 31 last, the profit is £185,115 (*£200,631*) after charging taxation of £235,581 (*£210,696*) including reserve for future tax of £15,000 (*£40,000*). The final Ordinary dividend is 25%, making 45% for the year, on capital increased by 10% share bonus (*same on smaller capital*). The directors are recommending a further capital bonus of one for three held.

British Thermostat Co.

A reference in the chairman's speech, given in June 19 issue, may be misleading. Col. Hudson's review was subsequently amended to read "during the year contracts were received for the supply of controls from the principal aircraft manufacturers, and a programme is under review, the total turnover value of which is expected to reach the £2½m. mark over the next year or so."

Fluctuations in the share price indices over the past three months or more appear to have stabilised somewhat during June. The difference between levels of both indices at the end of May and June were slight. The "Financial Times" index for all industrial shares fell by 1.4 *to* 88.5, *and the "Electrical Times" index for electrical shares rose slightly to* 84.2. *Figures are based on the average prices ruling during* 1948



Commercial Information

CONTRACTS OPEN

HOME

July 11.—Bedlington (Northumberland) U.D.C. Supply of electric fittings and cable for council housing schemes. Surveyor, Council Offices.

July 11.—Colne Valley (Yorks) U.D.C. Supply and erection of seven mercury lamps and 25 ft columns at Town-End, Golcar. Engineer and Surveyor, Municipal Offices, Carr Lane, Slaithwaite, nr. Huddersfield.

July 11.—Durham. Electrical installation at School of Agriculture, Rural Domestic Economy Centre, Houghall. Applications by above date to G. R. Clayton, County Architect, Court Lane.

July 11.—Sheffield. Electrical installation in 414 dwellings on Hackenthorpe estate. W. Geo. Davies, City Architect, Town Hall. Deposit £1.

July 12.—Maesteg U.D.C. Wiring of 126 houses on Turberville site. Engineer and Surveyor's Dept., Council Offices, Talbot St., Maesteg, Glam.

July 12.—Prescot U.D.C. Supply, erection and commissioning of sodium vapour discharge lighting units on Liverpool-Warrington trunk road, A.57. Distance is about 2,886 yd. Council Offices. Deposit £2 2s. (See June 26 issue.)

July 12.—Seaford (Sus.) U.D.C. Provision and erection of 27 concrete columns and lanterns on Marine Parade and Esplanade. C. G. Thompson, Engineer and Surveyor, Municipal Offices.

July 14.—Fife. Electrical work in extensions to Madras College, St. Andrews. Applications by above date to J. M. Mitchell, County Clerk, County Bldgs., Cupar.

July 14.—Selkirk T.C. Supply and erection of mercury street lighting along about 1,135 yd. of Edinburgh-Carlisle trunk road within burgh, to Group "A" standard, comprising 31 units. W. Y. Carmichael, Town Clerk, Municipal Buildings.

July 16.—Gloucester. Supply and installation of two electrically driven well pumps at Newent station. Pumps to be driven by shafts from vertical motors on surface. J. H. Goodridge, City Surveyor and Water Engineer, 21 Eastgate St. Deposit £2 2s. (See May 29 issue.)

July 16.—Hull. Electrical installation in 30 flats on three sites. City Architect, Guildhall. Deposit £1 1s.

July 18.—Londonderry. Complete electrical installation at Garvagh Intermediate school. J. R. W. Murland, Consulting Engineer, 13 Wellington Place, Belfast. Deposit £3 3s.

July 18.—Londonderry. Electrical installation at Portstewart primary school extension. F. W. Parkinson and Partners, Consulting Engineers, 6 Murray St., Belfast. Deposit £3 3s.

July 18.—Peterhead T.C. Site works including laying of electricity to about 100 houses at Catto Drive. Burgh Surveyor, Municipal Chambers.

July 19.—Manchester. Electrical installation to main hall and outbuildings, Superintendent's House, and drive lighting at Oakwood Hall, Romiley. City Architect, Town Hall. Deposit £1 1s. (See June 19 issue.)

July 21.—Kingston-upon-Hull. Supply and erection of complete house service wiring installation of some 600 points at new sewage pumping station for West-Hull and Haltenprice Joint Advisory Committee. Application should be made by above date to City Engineer, Guildhall. Eventual deposit £5. (Advertised in this issue.)

July 21.—Leven T.C. One grit pump with electric motor, starter, etc., and two electrically operated motorised penstocks required in mains drainage scheme. Council's Consulting Engineer, Blyth and Blyth, 135 George St., Edinburgh.

July 21.—Sunbury - on - Thames U.D.C. Wiring and equipping for lighting by electricity in 92 houses at Green Lane, Green Leas and Cavendish Rd. Engineer and Surveyor, Council Offices.

July 22.—Bunny (Notts). Heating by electricity of Bunny Church. Vicar's Warden, The School House, Bunny.

July 23.—Goole T.C. Supply of 68 concrete street lighting columns and 68 lanterns, sodium lamps, etc. Borough Engineer, Municipal Offices. (Advertised in this issue.)

July 23.—Seaham U.D.C. Electrical work in 42 houses on Westlea Estate. Engineer and Surveyor, Cliff House.

July 24.—Dublin. Electrical installation in new buildings at hospital at St. Joseph's, Clonsilla. Nicholas Mathews, Consulting Engineer, 42 Fitzwilliam Place. Deposit £10 10s.

July 26.—Bourne (Lincs.) U.D.C. Wiring and installation of electricity in 185 dwellings. Surveyor, North Street.

July 26.—St. Neots U.D.C. Supply and erection of eight concrete columns with lanterns and 100 W tungsten lamps, wiring, etc., on Huntingdon Rd. Estate. Council's Surveyor, Council Offices, Huntingdon St., St. Neots. (Advertised in this issue.)

July 28.—Hastings T.C. Electrical installation at Tivoli primary school. Borough Engineer, 37 Wellington Sq. Deposit £2 2s. (See July 3 issue.)

July 28.—N. Ireland. Electrical installation in 126 dwellings at Rathcoole for N.I. Housing Trust. Trust offices are at 12 Hope St., Belfast.

July 29.—Esher U.D.C. Installation of Class "A" street lighting over 1⅛ miles of Portsmouth Rd., including concrete columns, lanterns, 140 W sodium lamps, control gear, fuses, etc. Engineer and Surveyor, Council Offices. Deposit £1 1s.

July 31.—Cheshire. Names of contractors for electrical installation work required by County Council for list of contractors and suppliers. Application forms should be returned to E. Mainwaring Parkes, County Architect, The Castle, Chester, by above date.

Aug. 1.—Belfast. Supply and erection of (*a*) three-phase l.v. high rupturing capacity switchgear, and (*b*) carbon dioxide fire extinguishing equipments for substations. Electricity Dept.,

E. Bridge St. Deposit £2 2s. (See June 19 issue.)

Aug. 1.—Belfast. Supply of (*a*) 3-phase l.t. oil-immersed circuit-breaker (Spec. No. G.174a), and (*b*) portable electric hoist (Spec. No. G.178). Electricity Dept., E. Bridge St. (Advertised in this issue.)

Aug. 5.—Dublin. Electrical installations at Dublin Regional Sanatorium, Blanchardstown, being built. Documents from P. D. Cinneide, Dept. of Health, Custom House. Deposit £20.

Aug. 7.—Strabane R.D.C. Supply of one electrically driven sludge pump and other equipment for Sion Mills sewerage scheme. Consulting Engineers, Croasdaile and Taggart, 36-38 Castle Arcade Bldgs., Belfast.

No date stated.—Coatbridge T.C. Electrical work in erection of houses in Kirkwood and Kirkshaws area. Apply to A. S. Thom, Town Clerk, Municipal Buildings.

OVERSEAS

*Details of items marked * may be obtained on application to the Board of Trade, Horseguards Avenue, S.W.1, quoting reference.*

July 24.—South Africa. Union Tender and Supplies Board, 271 Visagie St. (P.O. Box 371), Pretoria, requires supply of 25 rectifiers, metal 200/250 V a.c. 50 c/s single-phase, d.c. output 6A, at negative 80 V and 6A at positive 80 V. B.o.T. (Ref. CRE 22664/52).*

July 25.—India. Supply of six 4,000 kVA 132/33-11 kV power transformers for Nellimerla, Bhimadolu, and Raj Ahmumdry substations, on Machkund H.-E. scheme. Superintending Engineer, Technical (Electrical), 157 Mount Rd., Madras 2. B.o.T. (Ref. CRE 23616/52).*

July 30.—South Africa. Dept. of Posts and Telegraphs require supply of 16,000 yd. co-axial cable (min. lengths of 1,000 yd.) and fittings. Union Tender Board and Supplies Board, 271 Visagie St. (P.O. Pox 371), Pretoria. B.o.T. (Ref. CRE 22665/52).*

Aug. 12.—Australia. Supply of diesel alternator sets to various specifications required by Director, Posts and Telegraphs, Melbourne. Documents from Chief Supply Officer's Dept., Room 406, Australia House, Strand, W.C.2, quoting Schedule C.6783.

Aug. 13.—South Africa. Supply of (*a*) seven panel l.t. switchboard with connections and cable; (*b*) one 20 kW diesel alternator unit and two 75 kW units; (*c*) two 50 kVA and one 150 kVA 11,000/400/231 V power transformers; (*d*) all material and erection of new overhead line network; and (*e*) all material for new lighting and or power service connections. These for Grobbersdal Municipality. Details from Dr. Jan K. Marais, Transvalia Bldg., 21 Stiemens St., Bloemfontein (P.O. Box 8006), Johannesburg. Cost £3 3s.

Aug. 15.—South Africa. Tenders invited by Municipality of Mariental for supply and erection of one direct coupled crude oil engine and alternator generating set of 100 kW with pressed-steel cubicle-type switchboard panels and control equipment. Town Clerk, Municipal Offices, P.O. Box 110, Mariental, or Consulting Engineer, H. M. S. Muller, P.O. Box 53, Kakamas.

Aug. 26.—Uruguay. Supply of total of 1,465,000 metrs copper conductors with weatherproof insulation for 220 V between phases. Usinas Electricas y los Telefonos del Estado. B.o.T. (Ref. CRE 22784/52)*.

Sept. 11.—South Africa. Stores Dept. of S. African Railways require supply of a number of 4-ton electrically driven portal jib cranes (tenders C4505 and C4544), and for 15-ton electrically driven portal jib cranes. Details from Chief Stores Superintendent, Room 202, Park Chambers, Rissik St., Johannesburg, or offices of S. Africa Stores Superintendent, S. Africa House, London.

Oct.—New Zealand. State H.E. Dept. invites tenders for supply Huntley 110 kV substation, of five sets of equipment as follows: (i) 100 MVA 11 kV switchgear of single busbar, metal-clad, indoor drawout type for Arapuni power station, closing date Oct. 7; (ii) 150 MVA 11 kv switchgear of duplicate busbar indoor, metal-clad drawout type for Thames substation, closing date Oct. 14; (iii) 250 MVA 11 kV switchgear of duplicate busbar indoor, metal-clad, drawout type for closing date Oct. 21; (iv) 10,000 kVA 110/33 kV transformer bank and spare unit for Palmerston substation closing date, Oct. 14; (v) same as (iv) for Milton substation, closing date Oct. 21. Plans can be seen at N.Z. Govt. Offices in London.

CONTRACTS PLACED

Carlisle. Electrical work in 108 houses, N. Western Electricity Board.

Edmonton B.C. Installation of electricity in Fore St. Redevelopment Scheme, Eastern Electricity Board, £1,123.

Your Queries — Answered

"Burrell" timing instruments, makers of? S.E.—A. G. Burrell and Co., Ltd., 24 Change Alley, Sheffield 1. (23347)

"Korduct" conduit, makers of? G.C.—Johns-Manville Co., Ltd., Artillery House, Artillery Rd., S.W.1, should be able to help. (23356)

"Vitalator" medical appliances, makers of? M.I.—There have been two firms supplying electro-medical apparatus under this name: (a) Ideal Home Electrical Appliances, Ltd., 45 Gt. Ormond St., W.C.1, for violet-ray apparatus, and (b) A. C. Gilbert Co., New Haven, Conn., U.S.A., for a vibrator. (23365)

"Geni" desk lamp, suppliers of? K.E.—Lustro Distributors, Ltd., 25 Millbank, S.W.1. (23374)

"Electrosan" sanitary units, suppliers of? L.E.—Warren Products, Ltd., 72 Victoria St., S.W.1. (23385)

Remote reading micrometer clock gauges, makers of? E.S.—Baldwin Instruments Ltd., Brooklands Works, Princes Rd., Dartford, Kent. Taylor, Taylor and Hobson, Ltd., 150 Holborn, E.C.1. (23396)

"Samica" mica foil, makers of? E.C.—Samica, Valdoie, near Belfort, France. (23404)

The above are selected from questions we have answered this week. If you have a query, send it to us.

Seaton Valley U.D.C. Electrical installation in 48 houses at Seaton Delaval and 34 at Cramlington, A. F. Jemison.

Walthamstow T.C. Electrical installation in 24 houses in Hoe Street., Cowlans Ltd., £1,186.

Willesden B.C. Electrical work at Gibbons Rd. School, London: Electricity Board, £5,138; installation of lifts in flats at Alpha Pl., Express Lift Co., £3,858.

PRICES OF CABLE METALS AND OTHER MATERIALS
(at Tuesday night)

	£ s. d.	New York price
COPPER, electrolytic	287 0 0	—
LEAD, good soft pig (foreign)	137 0 0	128 0 0
,, ,, ,, "English" quality ...	138 10 0	
Tin (99—99·76%) ... ...(Cash)	969½-970	—
,, (3 months)	966½-967	—
ALUMINIUM, commercial purity (del.)	157 0 0	—
ZINC	130 0 0	120 0 0
ARMOURING:		
Galv. Steel Wire (0.104 in.) ...	55 0 0	—
Mild Steel Tape (0.04 in.)	39 15 0	—

TRADE MARKS

This information is extracted from the Official Journal by permission of the Controller.

Fridor. 706,766. Class 9. Radio and television sets and vacuum cleaners. N. V. Fridor Fabrieken, Leeghwaterplien 27, 's-Gravenhage, Holland.

Kenmix. 705,697, Class 7. Mixing machines for treating foodstuffs. Kenwood Electrics Ltd., Kenwood Works, Ripley St., Old Woking, Surrey.

Maestrovox. 706,531. Class 15. Electronic organs. Maestrovox Ltd., 30 New Broadway, Uxbridge Rd., Hillington Heath, Middx.

Merdeka. 706,209. Class 10. Electrical apparatus for use in physiotherapy and for preventing the growth of hair on the human body by destroying the roots. J. T. Dunn, 24 Meltham Mills Rd., Meltham Mills, Huddersfield, Yorks.

Miniseel. 703,252. Class 9. Electrical goods and apparatus. **Miniseel,** 702,358 and **Scolaseel.** 702,359. Class 11. Stage lighting regulators, etc. Stage Electrical Equipment, Ltd., 66 Offley Rd., The Oval, S.W.9.

Tok. 706,023. Class 9. Electric rotary switches. Bentima Ltd., 18 Bury St., E.C.3.

Webslight, Ltd., with design. 705,354. Class 9. Luminous signs for export. Webslight, Ltd., 265 Martin's Bank Buildings, Water St., Liverpool.

GAZETTE ANNOUNCEMENTS

COMPANIES ACTS

John V. Barke Ltd., electrical engineer and contractor of Saltney, Cheshire. Silas Oliver Henry of 5 Rumford Pl., Liverpool, has been appointed liquidator with committee of inspection.

Daco Refrigeration Ltd. Petition for winding-up presented and directed to be heard at the Court House, Lichfield St., Walsall, on July 31 at 10.30 a.m. Interested persons should communicate with A. Cotterell and Co., Solicitors, 35 Bridge St., Walsall.

Rex Meters Ltd. Resolution for voluntary winding-up passed at meeting on June 19. C. R. Humphreys Hope of Gundry Cole and Co., C.A., 3 Great Winchester St., E.C.2, has been appointed liquidator.

Electra Sales (Essex) Ltd. Meetings of members and creditors will be held at Goodman Jones and Co., 3 Broad St. Bldgs., Liverpool St., E.C.2, on July 21, at 3 p.m. and 3.30 p.m. resp., to receive liquidator's report.

Henray Electrical Co., Ltd. David Morgan of 100 Park St., W.1, has been appointed liquidator with a committee of inspection.

Grant and Bowles Ltd., refrigerator sales and servicing of High Holborn, W.C.1. Liquidator, T. H. Hazlem of 74 Great Russell St., W.C.1, released as from June 18.

R. D. Powell Ltd., radio and electrical dealers of Hove. N. W. Osborne of 11-12 Finsbury Sq., E.C.2, liquidator, released as from June 18.

M. C. Usher, of Hurlingham, London, S.W.6, electrical contractor. At first meeting of creditors there was no quorum present and case was left in hands of Official Receiver as trustee.

BANKRUPTCY ACTS

Release of Trustee

Dewsbury. Arthur Ball, electrical engineer, trading at 10 Wild Bldgs., Birstall. Trustee was W. H. Meredith, Official Receiver, Hallfield Chambers, 71 Manningham Lane, Bradford.

TRADE NOTES

Change of Address. The Addison Electric Co. have moved their offices and works to Bosworth Road, London W.10. Tel.: Ladbroke 4280. They are retaining their showroom premises at 163 Holland Park Ave., W.11 (Tel.: Park 6760).

Egypt Import Control. The list of goods for which an exchange control permit is now required before they may be imported from certain countries, including Britain, into Egypt includes electric irons, domestic electric refrigerators, water heaters and other unspecified domestic electric apparatus and radio sets.

Eire Duties. Under a new order of the Irish Republic, lampshades of textile, cellulose, parchment or similar material now carry British preferential duty of 33⅓% *ad valorem* or 8d. each (whichever is greater), while the full duty is 50% (or 1/-); and for component parts 33⅓% and 50% *ad valorem*, respectively.

Holidays. The factory of Clang Ltd. will be closed between July 25 and August 12.

The Cotswold Works of Gillott Electro-Steam Cookers, Ltd., will close from July 25 to August 11 inclusive.

The Head office and works of Higgs Motors Ltd. will be closed between July 25 and August 11.

The Luton works of the Jackson Electric Stove Co. will shut from July 18 till August 5.

New Factory. On July 1, only 21 days after a contract had been signed to take over the still-uncompleted factory, production started in a new E. K. Cole, Ltd., works near the main factory at Southend-on-Sea. The new building in Kenway Rd., Prittlewell, has a manufacturing area of 14,200 sq ft.

Move. The Telegraph Construction and Maintenance Co. propose to transfer their Metals Division to a new factory at the satellite town of Crawley, Sussex.

BUSINESS PROSPECTS

HOME

Aberdeen T.C. Plans approved for erection of 30 flats in Rosehill Drive.

Adlington U.D.C. Construction of 38 houses on Park Rd. site. Council's Architect, W. E. Mayer, 12 Cleveland St., Chorley.

Ashby Woulds (Leics.) U.D.C. Application to be made for sanction to borrow £49,670 for erection of 34 houses on Norris Hill Estate.

Banffshire. Approval given to erection of 34 houses at Gardenstown and eight on three other sites.

Bethnal Green. It is proposed to develop Wellington estate extension by provision of 46 flats and other works. Estimated cost, £96,250.

Beverley R.D.C. Construction of 22 houses at Swanland. G. Pallfreyman, Engineer, Surveyor and Architect, 36 Market Place.

Billingham U.D.C. Erection of 88 houses under three contracts. Council's Architects, Kitching and Co., 21 Albert Rd., Middlesbrough.

Bodmin T.C. It is proposed to build 30 houses in Rock Lane.

Bradfield (Berks) R.D.C. Approval sought for erection of 100 houses at Clacot and Mortimer.

Bridgend (Glam.) U.D.C. Erection of 34 houses on West House Site No. 1. D. J. Amos, Engineer and Surveyor, Council Offices, Glan-Ogwr, Bridgend.

Bury St. Edmunds T.C. Construction of 42 flats in seven blocks on Mildenhall Rd. Estate. Mitchell and Weston, Architects, 38 Churchgate Street.

Bury T.C. Erection of part of Walmesley Primary and Junior School in Springside Road. Borough Engineer, Town Hall.

Campbeltown. Construction of 50 houses on Calton site for Scottish Special Housing Association has been approved.

Carlisle. Plans for Harraby Junior School.

Clutton (Som.) R.D.C. Approval granted to erection of 42 houses.

Consett U.D.C. Erection of 36 houses on Moorside site. J. J. Eltringham, Derwent St., Blackhill.

Corby (Northants). Approval sought for erection of 16 shops in Welland Vale Rd. scheme, and 15 on Lodge Park Estate.

Croydon T.C. Plans finalised for second stage of £24,200 Cypress Infants' School. Factory extensions proposed by E. W. Puckert, Ltd., at Thornton Heath, and by A. B. Mould and Construction Co., Ltd., in Vulcan Way. It is also proposed to build 39 flats and 34 houses on various sites.

Darlington. Construction of 35 houses at Heighington for R.D.C.; plans by Hutton and Hutton, 24 Southend Ave. Work is expected to start in Oct. on Hutton Ave. primary school, and it is intended to include three new schools in next year's building programme. Borough Architect is E. A. Tornbohm, Central Buildings.

Doncaster T.C. Wheatley secondary school to be built in Hills Lane.

Edinburgh. Dean of Guild Court has approved plans for erection of 748 houses in Hyvots Bank area at cost of £1,059,963.

Eston (Yorks). Shell-Mex and B.P., Ltd., are planning oil distribution depot at Teesport. Work expected to begin early next year.

Falmouth T.C. It is proposed to erect 234 dwellings in next three years to complete a site in Dracaena Ave.

Gravesend T.C. Erection of 50 houses on Westcourt Estate. Borough Engineer and Surveyor, 6 Woodville Terrace.

Guildford T.C. Tenders likely to be invited shortly for erection of 50 houses on various sites and 10 in Almond Close area

Hemsworth U.D.C. Erection of 44 houses and six bungalows on Moorshutt and Kinsley Estates. C. Earnshaw, Clerk of Council, Council Offices, White Hall.

Also erection of 64 houses in five groups for R.D.C. S. Price, Engineer and Surveyor, Brierley Hall, Brierley, nr. Barnsley.

Howden (Yorks) R.D.C. Erection of 30 houses on various sites. Blenkinsopp and Thompson, Architects, Clifton Chambers, Park St., Selby.

Huddersfield T.C. Ministry has approved erection of further 70 houses on Bradley Estate.

Isle of Man. Tynwald has approved erection of school at Ballascalla. Estimated cost is £16,500.

Kingston-on-Thames T.C. Negotiations in hand for erection of second stage of Kingston Grammar School. E. R. Babbs and Sons, 40 St. James Place, London S.W.1, likely to be appointed quantity surveyors.

Lambeth B.C. Scheme approved for development of Upper Tulse Hill site. It involves primary and nursery schools, library, shops and a total of some 559 dwellings.

Lewes T.C. Erection of 40 houses on Church Lane Estate North. Borough Engineer and Surveyor, C. T. Butler, Council Offices, Fisher Street.

Loftus U.D.C. Another 24 bungalows and 14 flats are to be built on Mars Farm Estate. Architect, C. D. Taylor, 41 Baxtergate, Whitby.

Longbenton U.D.C. Loan sanction being sought for £172,300 for erection of 128 houses at Burradon. Surveyor is R. E. Sweetman.

Malvern U.D.C. Erection of 48 houses in Worcester Rd. Surveyor and Water Engineer, Council House.

Margate T.C. Tenders may be invited soon for erection of 36 flats in Upper High St. development area.

Market Harborough U.D.C. Sixteen houses and eight flats to be built to plans by Council's Architect.

Newton Abbot U.D.C. Construction of 61 houses and 10 bungalows on Buckland Estate. Surveyor, Cyril Lunn, 18 Devon Sq.

Newtown and Llanllwchaiarn (Montgom.) U.D.C. Permission being sought for erection of 36 houses on Garthowen site.

Richmond (Yorks) T.C. Erection of block of flats at Bargate. Also 44 houses are to be built in Gilling Rd. area.

Sheffield. Erection of branch library in Margetson Crescent proposed.

Shildon (Dur.) U.D.C. Forty-one houses to be built on Jubilee Fields. Surveyor is J. W. Paterson.

Sittingbourne and Milton U.D.C. Erection of 26 dwellings on Canterbury Rd. Estate. Engineer and Surveyor's Office, High St., Sittingbourne.

Stretford T.C. Thirty flats being built in Stretford Rd. scheme.

A. H. Perry, Borough Surveyor, Town Hall.

South Shields T.C. Approval granted to erection of 10 houses and 20 bungalows in Marsden Rd. John Reid is Borough Engineer.

Whitley Bay U.D.C. Contracts to be let shortly for erection of 28 houses in Albert Rd., Seaton Sluice. Council's Surveyor is E. Roberts.

Wigston (Leics.) U.D.C. Further 39 houses are to be constructed in the area and plans in hand for another 54 houses later.

Wrexham. Approval in principle received for alterations at Maelor General Hospital for Management Committee. Estimated cost £18,870.

OVERSEAS

U.S.A. Quotations for conservators for deep-freeze food storage of from 4 to 20 cu ft capacity, with self-contained units suitable for 110 V, 50-60 c/s supplies, required by Homer King Inc., 1006-8 S. Tacoma Ave., Tacoma 2, Washington.

MEETINGS TO NOTE

TUESDAY, JULY 15

ELECTRONICS EXHIBITION organised by Instn. of Electronics (N.W. Section) at College of Technology, Manchester. Open until July 18.

WEDNESDAY, JULY 16

A.S.E.E. (S.W. London Branch).—"Power Factor Correction." J. Fletcher and T. A. Williams. Guild House, Worple Way, Wimbledon, 7.15 p.m.

THURSDAY, JULY 17

E.I.B.A.—Extra-ordinary and annual meeting at I.E.E., Savoy Place, W.C.2, 11 a.m.

NEW COMPANIES

Extracted from the Register issued by Jordan and Sons, Ltd., 116 Chancery Lane, London W.C.2.

J. B. Andrews (Electro-Mech) Ltd., Felden Works, Hartfield Cres., Wimbledon, S.W.19. Manufacturers of and dealers in all kinds of electrical equipment, etc. Cap.: £3,000. Dirs.: J. B. Andrews and Gladys B. Andrews and L. H. H. Cooper.

Arnot Designs, Ltd., 12 The Green, Richmond, Surrey. Technical and design consultants in connection with mechanical, electrical, hydraulic and production engineering, etc. Cap.: £100. Dirs.: A. R. E. Arnot and Vera L. Arnot.

Autoproductions (Sunbury-on-Thames) Ltd., 53 Green St., Sunbury-on-Thames, Mx. Automatic precision, general, mechanical, electrical and radio engineers, metal workers, etc. Cap.: £1,000. Dirs.: E. G. R. Fisk and G. Fisk.

Baldwin Electrical Co. (St. Marylebone) Ltd., 45 Dorset St., Baker St., W.1. Electrical engineers and contractors, etc. Cap.: £600. Dirs.: C. E. Baldwin, S. R. Baldwin and Mrs. E. M. Baldwin.

Boilers (Coventry), Ltd., Wellington Hse., Windmill Lane, Berkswell, Warwicks. Manufacturers of and dealers in boilers and furnaces of all kinds (including oil, gas, electric and solid fuel operated), etc. Cap.: £100. Dirs.: Mrs. P. E. Ward and R. Clews.

Bracken Electric Co., Ltd., 10a St. Andrews St., Northampton. To take over business of electrical engineers carried on at Northampton by George Bracken and Vera E. Bracken. Cap.: £3,500. Dirs.: G. Bracken and Mrs. V. E. Bracken.

Carfelts Ltd. Manufacturers of and dealers in textiles, rubber, rubber substitutes, motor, electrical, mechanical, constructional and general engineers, etc. Cap.: £1,000. Dirs.: to be appointed by subs. Subs.: Phyllis M. Cordell and J. Cooper, 89 Kingsway, W.C.2.

Colborne Engineering Co., Ltd., 22 Hans Rd., Brompton Rd., S.W.3. Electrical, general, motor, marine and mechanical engineers and machinists, etc. Cap.: £2,000. Dirs.: S. C. Osborne and G. R. Collings.

Mark Cumner Ltd., 4 Chapel Walks, Manchester 2. Mechanical, motor, electrical, oil fuel, heating and constructional engineers, etc. Cap.: £100. Dirs.: M. C. Jarman-Cumner and Gladys Jarman-Cumner.

E. A. Green and Sons Ltd. General, civil, mechanical and electrical engineers, etc. Cap.: £1,000. Dirs.: to be appointed by subs. Subs.: A. F. Green, 54 Twickenham Rd., Teddington, Middx. and H. V. Green, 112 Queensway, Bayswater, W.2.

F. Goodall and Co., Ltd., 134 John Clay St., South Shields Electrical and electronic engineers and contractors, etc. Cap.: £1,000. Dirs.: F. Goodall and H. Coates.

Hall and Veret, Ltd., 434 Rochester Way, Bexley, Kent. Manufacturers of and dealers in electric bedwarmers, heaters, stoves, cookers, etc. Cap.: £1,000. Permt. dirs.: R. G. Hall and W. K. Cooper.

E. H. Hall and Partners, Ltd., 58 Croydon Rd., Beckenham, Kent. Manufacturers of and dealers in electrical devices, machinery, etc. Cap.: £5,000. Dirs.: E. H. Hall and Hilda S. Hall.

H. Houseman Ltd., 39 Albion St., Leeds 1. Electrical refrigeration, wireless, television, mechanical and general engineers and contractors, etc. Cap.: £1,000. Dirs.: H. Houseman and Mrs. M. D. Houseman.

International Time Recording Co., Ltd., International Works, Beavor Lane, Hammersmith, W.6. Manufacturers of and dealers in time recorders, clocks, registering devices, etc. Cap.: £100. Dirs.: H. K. Chauncey and E. S. Howard.

Lewis and Cosslett, Ltd., 9 Taff St., Pontypridd, Glam. Mining, civil, constructional, mechanical, motor, electrical and general engineers, etc. Cap.: £5,000. Dirs.: L. C. Lewis, G. C. Cosslett and Mrs. V. Pearce.

Maestrovox Ltd., 2 Lord North St., S.W. Organ builders, electronic instrument manufacturers, etc. Cap.: £1,000. Dirs.: R. G. W. Hewitt and Mrs. M. T. Hewitt, and V. H. Ward.

Modern Mechanisation, Ltd., 687 Finchley Rd., N.W.2. Electrical, mining, chemical, civil, mechanical and general engineers, etc. Cap.: £20,000. Dirs.: J. H. Booth, H. J. Abisch and H. Booth.

New Era Commercial Refrigeration Services, Ltd., 42 Kilburn High Rd., N.W.6. Cap.: £100. Dirs.: B. Uzel and Mrs. E. Uzel.

Henry A. Patterson and Partners Ltd., 19, Dunraven St., W.1. Electrical wholesalers and merchants, fitters, factors, maintainers and repairers of electrical apparatus and accessories, etc. Cap.: £1,000. Permt. dirs.: H. A. Patterson and Gwendoline E. Patterson.

Trymech, Ltd., 7 Mill St. Ludlow, Salop. Consulting, mechanical, electrical, radio, engineers, etc. Cap.: £200. Dirs.: D. Capper and Mrs. E. Capper.

Hewittic Rectifiers

REGD. TRADE MARK

FOR D.C. supply to industrial works . . . to operate cranes and conveyors, all variable speed D.C. motor-driven machinery, magnetic equipment, electrolytic plant . . . it is obviously wise to specify converting plant that is supremely reliable, easily installed in the smallest possible space, highly economical, requires negligible maintenance and operates COMPLETELY UNATTENDED.

These requirements are fully met by HEWITTIC RECTIFIERS, which are supplied up to any capacity, for the heaviest service, e.g., operating steel rolling mills and electric traction systems, or in small units for such applications as battery charging for works electric vehicles.

Hewittic rectifiers are also ideal to replace obsolete rotary converting plant or local D.C. generating equipment, providing a greater D.C. output in the same floor space.

the *proved* plant for D.C. industrial supply

Send for Publication R.222.

HACKBRIDGE AND HEWITTIC ELECTRIC CO. LTD., WALTON-ON-THAMES, SURREY

Telephone: Walton-on-Thames 760 (8 lines) Telegrams: "Electric," Walton-on-Thames

"A job to be proud of!"

What satisfaction in a job well done. It is *inevitable* with Metallic quality and consistent accuracy.

Screwed and Socketed Conduit Thread.

Sunk-type Switch Iron Cover.

Sunk-type Plug Fitting Iron Cover.

Direct Mounting Flat-type Ceiling Rose.

It always pays to SPECIFY METALLIC

CONDUIT TUBE & FITTINGS

A TI COMPANY

THE METALLIC SEAMLESS TUBE Co. Ltd., Ludgate Hill, BIRMINGHAM 3. Tel. CEN 7167

Also at London, Newcastle-on-Tyne, Leeds, Swansea and Glasgow

CLASSIFIED ADVERTISEMENTS

OFFICIAL TENDERS AND APPOINTMENTS

WANTED · FOR SALE WORK WANTED

Those wishing to advertise in these pages should send the text to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia Street, London W.C.2, before 10 a.m. on TUESDAY of week of issue. Official Displayed Advertisements are charged at 42s. per inch, and all other classified advertisements at 3s. per line. Situations Wanted will be published four times for twice the single insertion rate. Fee for Box No. and postage on replies is 2s.

TENDERS INVITED

HULL CORPORATION

THE WEST HULL AND HALTEMPRICE JOINT ADVISORY COMMITTEE is prepared to receive tenders from specialist wiring contractors for the SUPPLY and ERECTION of a complete HOUSE SERVICE WIRING INSTALLATION of some 600 points at a new sewage pumping station now being erected in Kingston-upon-Hull. The work is of a highly specialised nature predominantly utilising mineral insulated copper-sheathed cable, and tenderers will be required to produce evidence that they have considerable experience in this class of work. Contractors wishing to tender for the work should, in the first instance, make written application to the City Engineer at the Guildhall, Kingston-upon-Hull, so as to arrive not later than Monday, July 21, 1952.

Contractors selected to tender for the work will be required to submit a returnable deposit of £5, but this should not accompany the initial application.

Tender documents and full details concerning the submission of tenders will be forwarded to the selected contractors immediately on receipt of the deposit.

WM. MORRIS, O.B.E., M.I.C.E., F.R.I.C.S., City Engineer.

City Engineer's Dept.,
Guildhall,
Kingston-upon-Hull.
July 1, 1952. (A 358)

CITY OF BELFAST

CIRCUIT BREAKER: ELECTRIC HOIST

TENDERS are invited for the SUPPLY and DELIVERY of:—

(a) Three-phase low-tension oil-immersed Circuit Breaker (Specification No. G.174a).
(b) Portable Electric Hoist (Specification No. G.178).

Forms of Tender and specifications may be obtained at the Electricity Department, East Bridge Street, Belfast.

Each tender, in sealed envelope marked "Tender for ..... Electricity Committee," and endorsed with the name and address of the tenderers, must reach the undersigned not later than 4 p.m. on Friday, August 1, 1952.

An official receipt must be obtained for each tender delivered by hand. Tenders sent by post should be registered.

The lowest or any tender will not necessarily be accepted.

JOHN DUNLOP,
Town Clerk.

City Hall, Belfast.
July 2, 1952. (A 357)

BOROUGH OF GOOLE

STREET LIGHTING EQUIPMENT

TENDERS are invited for the supply of:—

(a) 68 CONCRETE LIGHTING COLUMNS
(b) 68 LANTERNS, SODIUM LAMPS, etc.

Specifications, Schedule and Forms of Tender will be supplied on application to the Borough Engineer, Municipal Offices, Goole.

Tenders, in plain envelopes endorsed "Street Lighting," to reach me by Wednesday, July 23, 1952.

The Council do not bind themselves to accept the lowest or any tender.

K. H. CHORLTON,
Town Clerk.

Municipal Offices,
Goole.
July 4, 1952. (A 383)

ST. NEOTS URBAN DISTRICT COUNCIL

HUNTINGDON ROAD HOUSING ESTATE
PROVISION OF ADDITIONAL STREET LIGHTING

TENDERS are invited for the SUPPLY AND ERECTION of eight spun CONCRETE COLUMNS together with LANTERNS and 100-watt tungsten filament lamps, together with wiring between service terminations and lanterns, including the transfer of existing lamp No. 150 to new position. The work of connection to the electricity supply will be undertaken by the Eastern Electricity Board.

Further details may be obtained from the Council's Surveyor at the address below, and sealed tenders in envelopes endorsed "Street Lighting" must be sent to the undersigned not later than July 26 next.

The Council do not undertake to accept the lowest or any tender.

L. HENDERSON,
Clerk of the Council.

Council Offices,
Huntingdon Street,
St. Neots, Hunts. (A 384)

APPOINTMENTS VACANT

Engagement of persons must be made through a Local Labour Office or Scheduled Employment Agency, if the applicant is a man aged 18-64, *or a woman aged* 18-59; *unless the person concerned is excepted or the employment is in a managerial or professional capacity, or is otherwise excepted from the provisions of the Notification of Vacancies Order*, 1952.

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

DISTRICT SENIOR COMMERCIAL ASSISTANT
Skye and Lochalsh Area

APPLICATIONS are invited for the position of District Senior Commercial Assistant, Skye and Lochalsh Area, with Headquarters at Main Street, Kyle of Lochalsh.

Candidates should have a sound knowledge of the application of the Board's Tariffs and should be thoroughly capable of interviewing prospective consumers, and the issuing of all types of Quotations and Agreements.

Candidates should also be capable of dealing with consumers' correspondence and statistics and all other matters relating to the consumers' section of the Commercial Department.

Salary and Conditions in accordance with N.J.C., Grade 4—£560 to £620 per annum.

Applications should be addressed to: Area Manager, Skye and Lochalsh Area, Main Street, Kyle of Lochalsh, Ross-shire, marked "CONFIDENTIAL." Full particulars of age, experience, present position and salary should be given. (A 335)

SINGAPORE CITY COUNCIL

Electricity Department

APPLICATIONS are invited from qualified ELECTRICAL or MECHANICAL ENGINEERS with operating and maintenance experience in modern high-pressure steam power stations for appointments on the permanent establishment for the new Singapore Power Station, e.g., CHARGE ENGINEERS. Initial salary, including current allowances for married man with family, approx. £2,037 p.a. Liberal fully paid home leave. Provident fund, paid passages. New flats for this staff now under construction.

Write at once to Messrs. Peirce and Williams (Agents to the Council), 1 Victoria Street, S.W.1, stating very briefly age, qualifications and experience. A memorandum will be sent to suitable candidates, giving further particulars and inviting full applications. (A 364)

ELECTRICITY SUPPLY COMMISSION
(Southern Rhodesia)

VACANCY: TEST ASSISTANT

APPLICATIONS are invited for the above vacancy which exists at the Commission's Test Department, Salisbury.

Technical qualifications: Graduate I.E.E. or equivalent. Approximately 12 years' general experience in electrical testing is required. This period does not include apprenticeship, which should preferably have been served in the Testing Department of a large overseas electrical engineering works.

Specific experience required is as follows:—

(1) To be fully conversant with the testing, dry-out and inspection of all types of power and distribution transformers, including on-load tap changing units.
(2) Induction line voltage regulating equipment.
(3) Switchgear of all types.
(4) Condensers.
(5) Alternators and associated equipment.
(6) A.C. and d.c. motors, including control equipment.
(7) Checking and testing h.t. metering cubicles, switchboards and control panels manufactured and assembled at the Commission's workshops.
(8) General knowledge of instruments, meters and associated equipment. Instrument and meter secondary circuits.
(9) All test work involved in commissioning e.h.t. substation equipment, including transmission lines.
(10) The successful applicant would be required to supervise and direct staff placed under his control at any time.

Applicants should be, preferably, within the 30 to 35 years age group. Age limitation may, however, be waived in the event of the applicant's experience and qualifications being suited to the Commission's requirements. Salary scale, £942 by £36 to £1,050 per annum.

The general conditions of service include a contributory pension scheme, medical aid society, holiday fund, 45 days' full-pay leave per annum, paid sick leave, child and dependent allowances where applicable. In addition to basic salaries, at present a cost of living allowance of approximately 18% applies. The appointment will be subject to satisfactory medical examination and three months' probationary period.

Applications, giving age, educational and technical training, and subsequent experience in chronological order, nationality, marital state with number and age of dependents, and enclosing copies of testimonials (which will not be returned) should be addressed to the Secretary, Electricity Supply Commission, P.O. Box 377, Salisbury, Southern Rhodesia, so as to arrive not later than July 23, 1952. (A 264)

BRITISH ELECTRICITY AUTHORITY
South Eastern Division

BRIGHTON "B" POWER STATION. SHIFT CHARGE ENGINEERS. Applicants should have had suitable technical training together with extensive experience in the operation of modern high pressure turbine and boiler plant and e.h.t. switchgear. Preference given to those with p.f. experience. Class "J," Grade 7, £792 per annum. Application forms obtainable from Station Superintendent, Brighton Power Station, Portslade-by-Sea, Sussex, to be returned to him by July 26, 1952.

Croydon "A" and "B" Power Stations. MAINTENANCE ENGINEER (MECHANICAL). Applicants should preferably possess B.Sc. degree or equivalent and have had experience in the control of labour. Extensive experience in the maintenance of high pressure turbine and boiler plant and power station auxiliaries essential. Class "K," Grade 6, £956 11s. per annum including London allowance. N.J.B. conditions of service for both positions. Application forms obtainable from Station Superintendent, Croydon "B" Power Station, Beddington Farm Road, Purley Way, Croydon, Surrey, to be returned to him by July 26, 1952. (A 361)

LONDON ELECTRICITY BOARD

TECHNICAL ASSISTANT
Design and Planning Branch

APPLICATIONS are invited for the above position in the Engineering Dept., of the North Eastern Sub-Area Headquarters at Stratford, E.15.

Applicants should have received a sound general and technical engineering training to Graduate I.E.E. standard, should have served an engineering apprenticeship with an electrical manufacturer or supply authority and should have some practical experience on distribution.

The post is graded under Schedule "A" of the National Joint Board agreement as Class "K," Grade 13—£591 3s. per annum, rising to £614 5s. per annum, inclusive of London Allowance.

Application forms obtainable from Establishments Officer, 46 New Broad St., E.C.2, to be returned completed by July 12, 1952. Please enclose addressed foolscap envelope and quote ref.: V/1481/T on all correspondence. (A 348)

SOUTH WEST SCOTLAND ELECTRICITY BOARD
Ayrshire Sub-Area

APPOINTMENT OF SECOND ASSISTANT DISTRICT ENGINEER
Mauchline District

APPLICATIONS are invited for the position of Second Assistant District Engineer in the Mauchline District of the above Sub-Area.

Applicants should be graduates of the Institution of Electrical Engineers or hold equivalent technical qualifications and have received comprehensive experience in the construction, operation and maintenance of l.v. and h.v. overhead and underground mains and sub-stations.

Salary and conditions in accordance with the National Joint Board Agreement, Grade 7, Class "C," £579-£602 per annum, subject to statutory deductions in respect of income tax and superannuation.

Suitable living accommodation can be provided for the successful candidate if married.

Applications in writing stating age, whether married or single, and giving full details of education, training, experience and present position to be received by the Manager, The South West Scotland Electricity Board, Greenholm Street, Kilmarnock, within fourteen days of the appearance of this notice.

R. RUSSELL BROWN,
Secretary.

Greenholm Street,
Kilmarnock.
July 5, 1952. (A 360)

CROWN AGENTS FOR THE COLONIES

TELEGRAPH INSPECTOR required by the Nigeria Government Posts and Telegraphs Department for two tours each of 18 to 24 months with prospect of permanency. Salary according to age and experience in the scale (including expatriation pay and temporary increase) £720, rising to £860 a year. Outfit allowance £60. Free passages for officer and wife, and assistance towards children's passages or their maintenance in the United Kingdom. Liberal leave on full salary. Candidates under 40 years of age must have had good experience of underground cable and overhead distribution work, including jointing of cables up to 1,000 pairs. Applicants who are on the staff of the General Post Office should submit their applications through their department.

Apply at once by letter, stating age, full names in block letters and full particulars of qualifications and experience and mentioning this paper, to the Crown Agents for the Colonies, 4 Millbank, London, S.W.1, quoting on letter M.25665A. The Crown Agents cannot undertake to acknowledge all applications and will communicate only with applicants selected for further consideration. (A 366)

BRITISH ELECTRICITY AUTHORITY
South Wales Division

Vacancy No. 52/52

APPLICATIONS invited for the following superannuable appointments in the Generation (Construction) Department.

(1) THIRD ASSISTANT ENGINEER (ELECTRICAL). N.J.B. AX/CX, Grade 5 (£629-£810 per annum).
(2) ENGINEERING DRAUGHTSMEN (MECHANICAL). N.J.B., D6 (£413-£547 per annum).

For appointment (1) applicants should possess the H.N.C. or equivalent and have works and drawing office experience, together with experience in design and preparation of schemes for switchgear, electrical auxiliaries, main and multicore cable work and lighting and heating of large power stations.

For (2) A knowledge of mechanical installations and plant layout is required. Preference given to candidates with H.N.C. or equivalent.

Application forms, obtainable from the Divisional Secretary at the address below, should be returned by July 23, 1952.

H. J. BENNETT,
Divisional Controller.

British Electricity Authority,
Cardiff (Pengam Moors) Airport,
Cardiff.
July 2, 1952. (A 362)

SOUTH WALES ELECTRICITY BOARD

REQUIRED, ENGINEERING DRAUGHTSMAN in the Western Sub-Area of the Board at Tenby.

Candidates should have had a sound engineering training and, in particular, experience in the design and layout of sub-stations up to 33 kV.

Salary will be in accordance with Schedule "D," Grade 6 (£413-£547) of the National Joint Board Agreement.

Applications stating age, present position and salary, qualifications and experience, and giving three referees to be addressed to the Secretary to arrive by July 19, 1952.

D. G. DODDS,
Secretary.

St. Mellons, Cardiff. (A 368)

BRITISH ELECTRICITY AUTHORITY

East Midlands Division

APPLICATIONS are invited for the following posts in the Construction Department of this Division.

MECHANICAL ENGINEERING DRAUGHTSMEN
Vacancy No. 59/52

Candidates should have had experience in the layout of boilers and turbines and auxiliary equipment. Condensing plant, coal and ash handling plant, h.p. and l.p. pipework installations.

ELECTRICAL DRAUGHTSMEN
Vacancy No. 60/52

Candidates should have had experience in the layout and installation of e.h.t. and l.t. switchgear, transformers, e.h.t. and l.t. cabling.

The salary for the above positions will be within Grade 4 (£651-£755 p.a.), Grade 5 (£547-£651 p.a.) or Grade 6 (£413-£547 p.a.) according to experience and qualifications.

The posts will be pensionable within the provisions of the Authority's Superannuation Scheme.

Applications should be submitted on the official form which may be obtained from the Divisional Establishments Officer, British Electricity Authority, Barker Gate, Nottingham, stating vacancy number, and should be returned not later than July 23, 1952.

L. F. JEFFREY,
Divisional Controller.

July 4, 1952. (A 371)

CROWN AGENTS FOR THE COLONIES

SENIOR ENGINEER required by the Government of Nigeria for the Department of Commerce and Industries for one tour of 18 to 24 months in the first instance. Salary according to age and experience in scale rising to £1,560 a year (including expatriation pay and temporary increase). Gratuity on satisfactory completion of service at the rate of £25 or £37 10s. (according to salary) for each completed period of three months residential service (including approved leave). Outfit allowance £60. Free passages for officer and wife and assistance towards cost of children's passages or their maintenance in this country. Liberal leave on full salary. Candidates should preferably hold a recognised degree in engineering of a British university or should have served a full apprenticeship and hold Higher National Certificates in mechanical and electrical engineering. They must have had executive experience in the practice of four or more of the following branches of engineering: civil engineering, electrical engineering, mechanical engineering, chemistry, chemical manufacture, textiles, pottery and ceramics, food, paper, tanning, fuel (coal, gas, oil). Some experience of industrial research is essential.

Apply at once by letter, stating age, full names in block letters and full particulars of qualifications and experience, and mentioning this paper, to the Crown Agents for the Colonies, 4 Millbank, London S.W.1, quoting on letter M.28738B. The Crown Agents cannot undertake to acknowledge all applications and will communicate only with applicants selected for further consideration. (A 372)

BRITISH ELECTRICITY AUTHORITY

Midlands Division

ASSISTANT ENGINEER (TECHNICAL RECORDS) required at Stourport Generating Stations. N.J.B. service conditions, superannuable appointment. Salary within Schedule "A," Grade J.12, commencing at £576 per annum.

Higher National Certificate in electrical or mechanical engineering or equivalent qualifications required, and operating experience in a high-pressure station an advantage.

Application forms available from the Establishments Officer, 53 Wake Green Road, Moseley, Birmingham 13, to be completed and returned not later than July 26, 1952.

F. W. LAWTON,
Divisional Controller.
(A 367)

SOUTH WALES ELECTRICITY BOARD

REQUIRED, THIRD ASSISTANT ENGINEER (SUB-STATIONS) in the Eastern Sub-Area of the Board, based on Cwmbran.

Applicants should have had a sound engineering training and be suitably qualified. Experience in the construction, commissioning and maintenance of all classes of sub-stations is required.

Preference will be given to applicants who possess the Higher National Certificate in electrical engineering, or its equivalent.

Salary will be in accordance with Class "J," Grade 10 (£660-£673-£685) of the N.J.B. Schedule.

Applications, stating age, present position and salary, qualifications and experience and giving three referees, to be addressed to the Secretary, to arrive by July 19, 1952.

D. G. DODDS,
Secretary.

St. Mellons, Cardiff. (A 369)

CENTRAL ELECTRICITY BOARD
MALAYA

CONNAUGHT BRIDGE POWER STATION
RESIDENT ENGINEER

APPLICATIONS are invited for the temporary post of Resident Engineer for the Connaught Bridge Power Station extensions. The existing power station consists of two 20 MW turbo alternators and four water tube boilers 120,000 lb. evaporation, oil and coal fired, 425 lb. sq. in. 825°F. total temperature, with ancillary equipment and the extension will consist of similar plant.

Candidates should be Corporate Members of one of the Senior Engineering Institutions or possess equivalent qualifications, and have had sound training in electrical and mechanical engineering with subsequent practical experience in the construction, installation, and operation of steam turbine generating plant, water tube boilers, E.H.T. switchgear, and auxiliary equipment.

The salary of the post is:—

Basic Salary	Expatriation Pay
$1,200 per month	$220 per month.

Malayan $=2s. 4d. $ a month by 7/5=£ a year.
Cost of Living Allowance.
According to Scale, subject to maxima.
Single Officer $240 p.m. Married Officer $430 p.m.
Married Officer with children, $505 p.m.

On the above scale the total emoluments for a married man with two children would exceed £2,500 p.a.

The appointment is temporary and for a period of two years in the first instance and subject to extension by mutual consent as the work may require.

Quarters, with heavy furniture are provided at a nominal rental if available, or an allowance paid in lieu.

Free passages and medical attendance for officer and family not exceeding four persons.

Leave will be granted at the rate of 45 days for each year subject to satisfactory service.

Applications endorsed "Resident Engineer Connaught Bridge," stating age, qualifications and experience should be forwarded within 14 days of the date of this advertisement, to the undersigned who will communicate with candidates selected for further consideration.

PREECE, CARDEW AND RIDER.
8-10 Queen Anne's Gate,
Westminster,
London, S.W.1. (A 346)

BRITISH ELECTRICITY AUTHORITY

London Division

APPLICATIONS are invited for the following superannuable posts. Salary, including London allowance and condition of service in accordance with N.J.B. Agreement.

SECTION LEADER (CIVIL ENGINEERING)
(Divisional H.Q.)

Section Leader required who, under the Chief Draughtsman, will be in charge of a number of Senior and Junior Civil Engineering Draughtsmen engaged in preparation of working drawings of the reinforced concrete and heavy structural steelwork associated with large power stations. Applicants should have had an extensive experience of this work with technical ability to suit. Salary, N.J.B., Schedule "D," Grade 3 (£792 15s. to £901 19s. p.a.).

INSTRUMENT ENGINEER
(West Ham Generating Station)

Applicants must be experienced in maintenance, testing and calibration of all types of power station electrical and mechanical instruments. Higher National Certificate preferable. Salary, N.J.B. Schedule "A," Class "H," Grade 12 (£572 5s. p.a.).

Applications, stating age, qualifications and experience, to Divisional Secretary, B.E.A., London Division, Ergon House, Horseferry Road, S.W.1, within 14 days of this advertisement. (A 365)

SOUTHERN ELECTRICITY BOARD

APPOINTMENT OF ASSISTANT SECRETARY
(ADMINISTRATION)

APPLICATIONS are invited for the appointment of Assistant Secretary in the department of the Secretary to the Board. The person appointed will be responsible to the Secretary for the work of the administrative section at the Head Office of the Board. The salary will be a provisional one within the range £1,250 to £1,750 per annum, and the future salary and conditions of service will be in accordance with agreements made from time to time by the appropriate negotiating body.

Applicants should have administrative experience in the electricity supply industry and legal experience would be an advantage.

Applications, to arrive not later than July 25, 1952, should be submitted to the Secretary, Southern Electricity Board, Southern Electricity House, Littlewick Green, Maidenhead, Berks.

F. W. KEMPTON,
Secretary.
(A 366)

THE ELECTRICITY CORPORATION OF NIGERIA

THE ELECTRICITY CORPORATION OF NIGERIA has the following vacancies on its permanent and contract staffs in Nigeria:—

(a) SUPERINTENDING ELECTRICAL ENGINEER. Corporate member I.E.E. plus a degree in engineering, age 35-45. Overseas experience an advantage. Total salary and allowances £1,600 p.a. Probable permanent post.

(b) ELECTRICAL ENGINEERS. Corporate membership I.E.E. Experience in design of thermal and hydro stations and in transmission. Age 28-35. Salaries within range £1,000 to £1,400, according to experience. Permanent posts.

(c) CIVIL ENGINEERS AND JUNIOR CIVIL ENGINEERS, with experience of power station design, thermal and hydro, or good general experience in reinforced and prestressed concrete work. Salaries within range £900 to £1,200 according to qualifications and experience. (These posts are on contract and not pensionable.)

(d) GENERAL ASSISTANT TO COMMERCIAL MANAGER. Preferably electrical/mechanical engineer. Experience in all branches of store replenishment and purchasing, both U.K. and Continental. Total salary £1,100 to £1,250. Possible permanency.

These posts carry excellent conditions of service. Furnished quarters at low rental. Low Income Tax. Tours 18 to 24 months. Liberal leave on full pay. Good prospects in rapidly expanding electrical authority. Forms of application and full particulars from E. C. Inston, Liaison Officer in the United Kingdom, Electricity Corporation of Nigeria, The Corner House, Great Peter Street, London S.W.1. (A 319)

SOUTH WALES ELECTRICITY BOARD

REQUIRED, FIRST ASSISTANT DISTRICT ENGINEER, District 101/2 (Haverfordwest) in the Western Sub-Area of the Board.

Applicants should have experience in the construction, operation and maintenance of sub-stations and underground and overhead high and low voltage mains in urban and rural areas.

Preference will be given to applicants who possess an engineering degree of a British university, the Higher National Certificate or its equivalent, or have passed the graduateship examination of the Institution of Electrical Engineers.

Salary in accordance with Class "C," Grade 4 (£699-£706-£713) of the N.J.B. schedule.

Applications, stating age, present position and salary, qualifications and experience and giving three referees, to be addressed to the Secretary to arrive by July 19, 1952.

D. G. DODDS,
Secretary.

St. Mellons, Cardiff. (A 370)

NORTH WESTERN ELECTRICITY BOARD

APPOINTMENT OF GENERAL ASSISTANT ENGINEER (STATISTICS AND PLANNING)

Sub-Area Engineer's Department, No. 3 Sub-Area

DUTIES will include network calculations, to assist in development and planning of h.v. and l.v. systems, preparation of statistical returns and to carry out investigations on system loading.

Applicants should hold a university degree or H.N.C. in electrical engineering. Experience in similar work would be an advantage.

Salary scale: £563-£585 p.a. Grade K13. N.J.B. conditions.

Applications to Sub-Area Manager, No. 3 Sub-Area, The North Western Electricity Board, Union Street, Oldham, by July 19, 1952. (A 359)

MIDLANDS ELECTRICITY BOARD

SECOND ASSISTANT DISTRICT ENGINEER required in the Stroud district of the Central Gloucestershire Sub-Area. Experience necessary in all branches of distribution work, including the operation and maintenance of high and low voltage, underground and overhead distribution systems. Technical qualifications desirable. Salary, £613-£623 per annum (N.J.B., Class "D," Grade 7), superannuable.

Apply in writing within 14 days, stating age, experience, present salary and position, and quoting reference GLOS T.145, to Mr. D. Holt, Manager, Midlands Electricity Board, 126 London Road, Gloucester.

A. STEPHENS,
Secretary.
(A 363)

BRITISH ELECTRICITY AUTHORITY

North Western Division

VACANCY No. 749.—SHIFT CHARGE ENGINEER at Westwood Generating Station, Wigan, Lancs. Salary, £704-£733 (N.J.B. G.7).

Apply to Establishments Officer, British Electricity House, 825 Wilmslow Road, Manchester 20, before July 21. (A 373)

COUNTY BOROUGH OF BLACKPOOL

APPOINTMENT OF A TECHNICAL ASSISTANT

APPLICATIONS are invited for the superannuable appointment of a Technical Assistant—General (A.P.T. III, £500 by £15 to £545) in the Electrical Services Department. The post is subject to special conditions as to office hours, particulars of which may be had on application.

The candidate will be required to prepare constructional drawings, layout plans and other technical work, principally for illuminations and street lighting, and must be a capable draughtsman with knowledge and experience in electrical engineering.

Applications, giving particulars of age, present position, qualifications and experience, including names and addresses of two referees to be forwarded to the Manager, Ministry of Labour and National Service, Queen Street, Blackpool, to reach him not later than July 17, 1952.

Canvassing of, or the submission of the names of, members of Council as referees will disqualify candidates.

TREVOR T. JONES,
Town Clerk.
(A 345)

BRITISH ELECTRICITY AUTHORITY

North Western Division

VACANCY No. 744—JUNIOR ENGINEER, Stuart Street Generating Station, Manchester. Shift duties, assisting control engineer. Salary commencing at £375, rising to £496 (N.J.B. H17/14).

Vacancy No. 746—SHIFT CHARGE ENGINEER, Greenhill Generating Station, Nr. Oldham. Salary commencing at £629, rising to £660 (N.J.B. Class "E7").

Apply to Establishments Officer, British Electricity House, 825 Wilmslow Road, Manchester 20, before July 21. Quote vacancy number. (A 347)

ELECTRICAL ENGINEER required, East Midlands. Graduate preferred. Apprenticeship with reputable electrical manufacturers. Experienced in design and specification of industrial a.c. and d.c. machinery, transformers, wiring and testing. Fully conversant with I.E.E. and Government safety regulations. Some knowledge electrical power supply and distribution, good mechanical background. Age about 30. Staff pension scheme.—Please submit full details of education, training and experience, and state salary required, to Personnel Manager, Box No. 1875, Electrical Times. (A 387)

ELECTRICAL ENGINEER required for electrical department of works in the North East. Should have a sound practical training, drawing office experience, a knowledge of motor control gear resistance calculations, and preferably some experience of electrical heating for industrial applications.—Apply, giving full details of experience, technical qualifications, age, whether married or single, and salary required, to Box No. 1871, Electrical Times. (A 376)

ELECTRICAL FITTER required by the British Electricity Authority, for the maintenance of h.v. switchgear and transformers and outdoor h.v. structures. Works apprenticeship and subsequent experience an advantage. Must be prepared to work substations in N.W. and S.W. London. Rates and conditions in accordance with N.J.I.C. Agreement for electricity supply industry. Present hourly rate, 3s. 8½d. for 44-hour 5-day week.—Apply, Ministry of Labour and National Service, St. Mary's Road, N.W.10, quoting Vacancy No. 3062. (A 375)

ELECTRICAL SALES ENGINEER wanted by old established engineering firm in the Leeds area. Age 25-40. To handle the sale of motors and switchgear by correspondence and negotiation. Higher National or National Certificate desirable. Progressive position. Superannuation scheme.—Applications, stating age and salary required, to Box No. 1873, Electrical Times. (A 378)

ELECTRONICS. ASSISTANT to take charge small lab. dealing with test and development wide range of equipment; must have good technical background and experience.—S.S. Electronics, Ltd., Byron Road, Harrow. (A 293)

GOOD ELECTRICIAN/WIREMAN wanted at once; used to all wiring systems and domestic equipment installation and repairs, factory power equipment and motors. Good wages to right man and special conditions. —Electrical Installations, Whitchurch, Hants. (A 250)

LEADING AND SENIOR DRAUGHTSMEN required for Transformer work of the largest class.—Apply by letter quoting "Transformer" and giving full details of age, experience and salary required to Staff Manager, The General Electric Co. Ltd., Witton, Birmingham 6. (A 258)

BOX No. replies to be addressed to the ELECTRICAL TIMES, Sardinia House, Sardinia Street, London W.C.2

Engagement of persons must be made through a Local Labour Office or Scheduled Employment Agency, if the applicant is a man aged 18-64, or a woman aged 18-59; unless the person concerned is excepted or the employment is in a managerial or professional capacity, or is otherwise excepted from the provisions of the Notification of Vacancies Order, 1952.

POWER STATION OPERATING ASSISTANTS required by Kuwait Oil Company for overseas services. Should be G.I.E.E. or G.I.Mech.E. or equivalent and in addition have either full apprenticeship or post graduate training with manufacturers of power plant equipment or experience in a steam power station. Knowledge of mixed pressure plant an advantage. Age 23-30. Salary starting £710 p.a. clear, plus generous allowances, pension scheme and kit allowance.—Write for application form giving personal details and quoting K.1543/4 to Box L/42 at 191 Gresham House, E.C.2. (A 307)

REPRESENTATIVE required by Electrical Wholesalers for London area. Must have good knowledge of Trade and an active connection with Industrial Concerns. Please apply in writing, stating qualifications, salary required and if car owner. Good permanent position for suitable applicant.—Box No. 1863, Electrical Times. (A 309)

REPRESENTATIVE wanted by well-known electrical wholesaler for Coventry area, to call on factories and contractors. Previous experience essential. Substantial existing connection handed over.—Box No. 1845, Electrical Times. (A 295)

SENIOR DRAUGHTSMAN required for work on electrical power resistances and large electric heaters for Industrial Applications. Previous experience on this class of work desirable but not essential.—Apply by letter with full details, including age, technical qualifications, whether married or single and salary required, to the Expanded Metal Co. Ltd., Stranton Works, West Hartlepool. (A 377)

THE COMMONWEALTH RELATIONS OFFICE invite applications for the post of ELECTRICAL ENGINEER for service with the Central Waterpower Irrigation and Navigation Commission, India. Applicants must be regularly trained electrical engineers, preferably about 45 years of age, with considerable practical experience in generation, transmission up to 66 kV, distribution and utilisation of electricity. The duties are concerned with the erection of power station plant, electrical transmission, distribution and the operation of electrical machines and equipment required for large-scale hydro schemes. The successful candidate will be required to guide and train the Indian engineers under his control. The appointment is for 2-3 years. Salary £1,300-£1,500 per annum, subject to United Kingdom income tax and tax-free allowance of £880-£1,080 per annum (depending on location) for a married man (£565 if single), with an allowance for children plus an allowance to cover board and lodging of the person appointed.—Application forms from: Ministry of Labour and National Service, Technical and Scientific Register (K), Almack House, 26 King Street, London, S.W.1, quoting Reference D567/51-O-A. (A 379)

THE GENERAL ELECTRIC CO. LTD. have several vacancies in their Overseas Sales Organisation for young ENGINEERS wishing to make their careers abroad after a period of training with the company at home. Applicants should hold an Electrical Engineering Degree or Higher National Certificate, preferably have had some sales experience, be under 30 years of age and single.—Apply in writing, giving full personal particulars, to the Staff Manager, Magnet House, Kingsway, London, W.C.2. (A 380)

WELL-KNOWN electric cooker manufacturers require a LADY DEMONSTRATOR with experience to cover Area Boards in Midlands.—Apply, Box No. 1869, Electrical Times. (A 374)

WITH OUR BUSINESS CONTINUALLY EXPANDING, good opportunities are now occurring for REPRESENTATIVES in and around the London area. Knowledge of lighting and fluorescent equipment an advantage. Good salary and commission.—Write S.A.S.M., Ekco-Ensign Electric Ltd., 45 Essex Street, Strand, W.C.2. (A 351)

WORKS FOREMAN required for small electrical engineers and rewinders shop, South Coast district. State experience and salary.—Box No. 1843, Electrical Times. (A 294)

WANTED

A.C.—D.C. MOTORS, STARTERS, complete change-over installations, etc.—A.A. Electrical Co., Ltd., 67 Rothschild Road, Chiswick Park, W.4. Tel.: Chiswick 5105. (A 11)

£50,000

Immediate cash available for purchase of New Ball and Roller Bearings, all types. Steel Balls and Rollers. Top prices paid, small quantities accepted.

CLAUDE RYE BEARINGS

895-921 Fulham Road, London, S.W.6
RENown 6174 (20 lines) (A 328p)

WANTED. D.C. and A.C. ball-bearing MOTORS, MOTOR GENERATOR SETS, DYNAMOS and ALTERNATORS.—Full details to Britannia Manufacturing Co., Ltd., 22-26 Britannia Walk, London N.1. (A 7)

WANTED for prompt cash, ferrous and non-ferrous SCRAP; also plant for dismantling. Buyers of secondhand machinery and plant for re-use.—W. and H. Cooper, Ltd., 176 Brady Street, Bethnal Green, E.1. (A 1)

WANTED, Large quantity of 4-in. outside diameter TUBES from the dismantling of old Babcock Water-tube Boilers. Best prices paid. Prepared to purchase Babcock and Wilcox Water-tube Boilers for dismantling. —Apply, giving full details, to Midland Iron and Hardware Co., Cradley Heath. (A 3)

WANTED, ROTARY CONVERTORS, any size.—Universal, 221 City Road, London E.C.1. (A 9)

WASTE MERCURY. Cash on delivery or on collection London area. Containers supplied. Also aircraft plugs, platinum contacts and precious and all scrap metals in any form. Forward samples.—Belgrave Buyers (E.T.), 5 Belgrave Gardens, N.W.8. MAI. 7513. (A 389)

WORK WANTED

A.C. and d.c. Motor Rewinds and Repairs. Prompt service, fully guaranteed. Edgware 8631 (4 lines). —Service Electric Co., Ltd., Stanmore, Middx. (A 19)

ARMATURE RE-WINDING SERVICE TO THE TRADE. Vacuums, drills, grinders, hood dryers, dental motors, vacuum cleaner armatures replaced from stock, 24 hours service. Every job guaranteed.—Regam Electric, 95 Park Lane, Leeds 1. (A 213)

CASTINGS, Fisher Foundries, Ltd., Greet, Birmingham, have capacity for brass, gun metal and soft grey iron machine moulded repetition castings weighing 1-30 lb. Loose pattern work up to 3 cwt. Delivery by road to all parts. Tel.: B'ham, Victoria 0197. (A 25)

CONDENSER AND TRANSFORMER CASES. Special boxes and covers. Sheet metal and press-work for the electrical trade. May we quote you? A.I.D. approved.—Conway-Tolhurst Ltd., Airport, Cardiff. (A 326)

METALWORK. All types cabinets, chassis, racks etc., to your own specifications.—Philpott's Metalworks, Ltd., Chapman Street, Loughborough. (A 352)

WELDING WORK WANTED. Large capacity available in all materials and methods. Keen prices and good workmanship. Difficult jobs our speciality. A.I.D. approved.—Conway-Tolhurst Ltd., Airport, Cardiff. (A 325)

AGENCIES

COMPANY SECRETARY visiting United States and Canada in October, willing to undertake additional commission.—Box No. 1867, Electrical Times. (A 354)

DIRECTOR visiting United States, end of September, willing to undertake additional commission.—Box No. 1865, Electrical Times. (A 353)

MANUFACTURERS' AGENTS ASSOCIATION, INC. (E.T.), 8 Bream's Buildings, London W.C.2, supplies free lists of Agents to Manufacturers seeking representation in important industrial centres. Membership available to established agents only. Particulars supplied. (A 4)

FOR SALE

AUCTIONS

E R

By order of the Minister of Supply.

No. 1 E.S. SUB-DEPOT (R.E.) SOUTH LITTLETON
Near Evesham, Worcester.

Important Sale by Auction of

GOVERNMENT SURPLUS PLANT AND STORES

Including: 2 Rolls Royce Merlin Engines, Tangye and Sulzer Water Pumps with petrol engines, 55 3-7½-ton Winches, Reception Sets.

Electrical equipment including: Switchfuses, Transformers, Electric Light bulbs, Condensers, Aerials, Junction boxes, Batteries, Heavy Armoured Hose.

Motor Transport equipment, Plant and Machinery, Dry Batteries, Galvanised Tanks, Tarpaulins, Canvas Covers, Office Furniture, Canvas Hose.

To be Sold by Auction by

E. G. RIGHTON & SON

at South Littleton Depot, on Thursday, July 24, 1952, commencing at 11 a.m.

View Days: Monday, Tuesday and Wednesday, July 21, 22 and 23, from 10 a.m. till 4 p.m., and morning of Sale from 9 a.m. till 11 a.m.

Admission by Catalogue only, Price 6d. (Postal Orders only) to admit two persons to view and one on Sale Day, may be obtained from the Auctioneers' Offices, Evesham, Worcs. (Tel. 6155.) (A 355)

CABLES & WIRE

2,000 YARDS 0·04 four-core P.I.L.C. and S. CABLE; any lengths cut. Immediate delivery.—E. M. Tatton and Co., Ltd., Kew Bridge, Brentford. Eal. 3155. (A 282)

DOMESTIC APPLIANCES

IMMERSION HEATERS, GRUBB. A limited number of 4 kW still available in 14 in., 26 in., 28 in., and 30 in., at old prices. Provision for intermediate loadings. Fully guaranteed. Immediate delivery.—Write for terms to Distributors, John Owner and Co., Ltd., Springfield Road, Birmingham 13. Tel.: Springfield 2939. (A 284)

IMMERSION HEATERS, Rubicon and Dragor 4 kW automatic. Length 12 in., thread 2½ in.; BSP; two-year guarantee; no P.T.—C.R.S. Ltd., 181 Upper Richmond Road, Putney, S.W.15. Tel.: PUTney 9130. (A 385)

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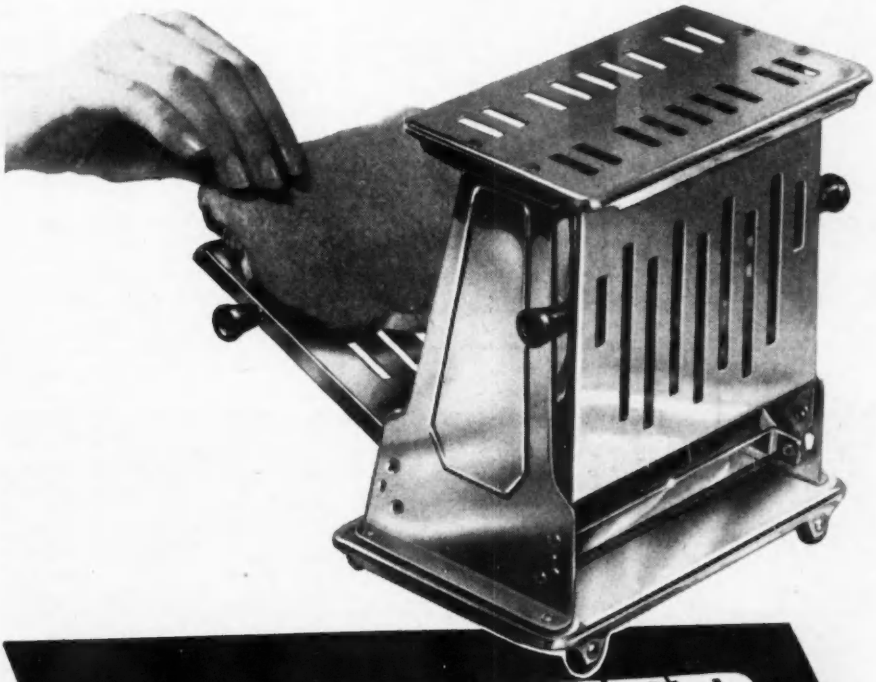

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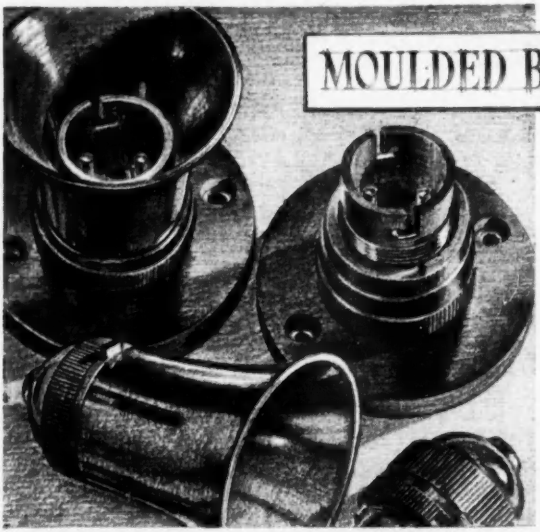

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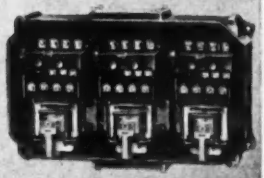

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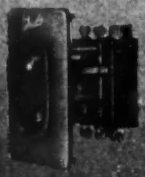

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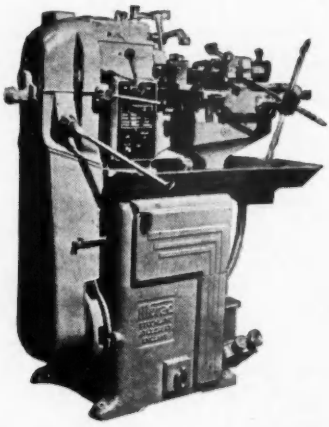

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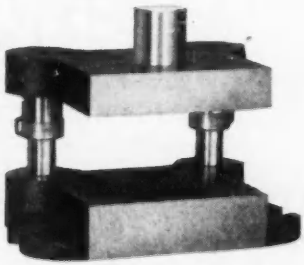

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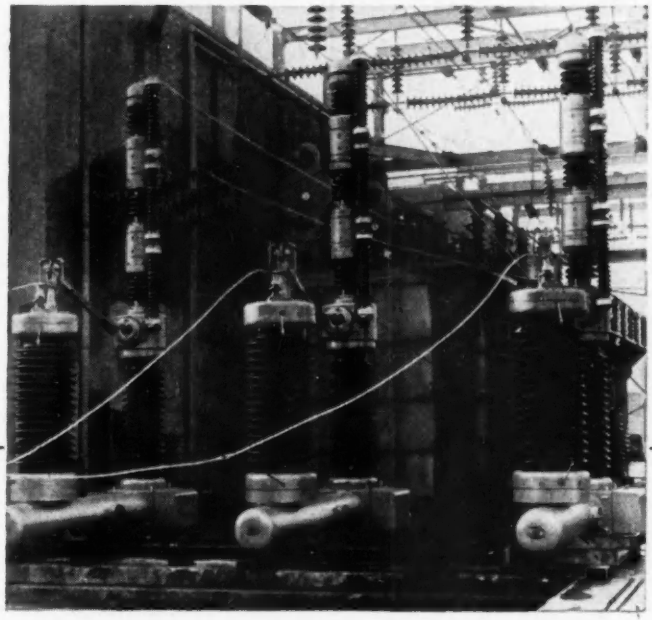

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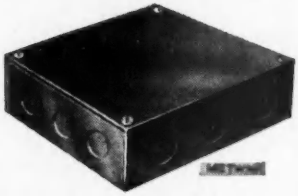

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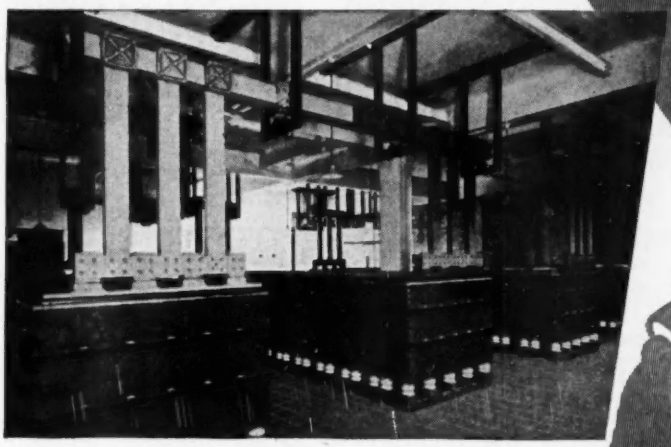

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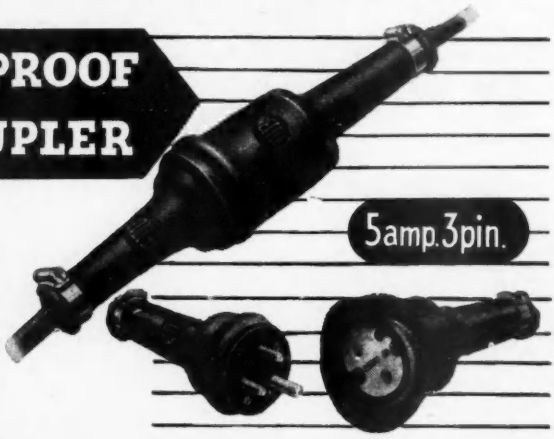

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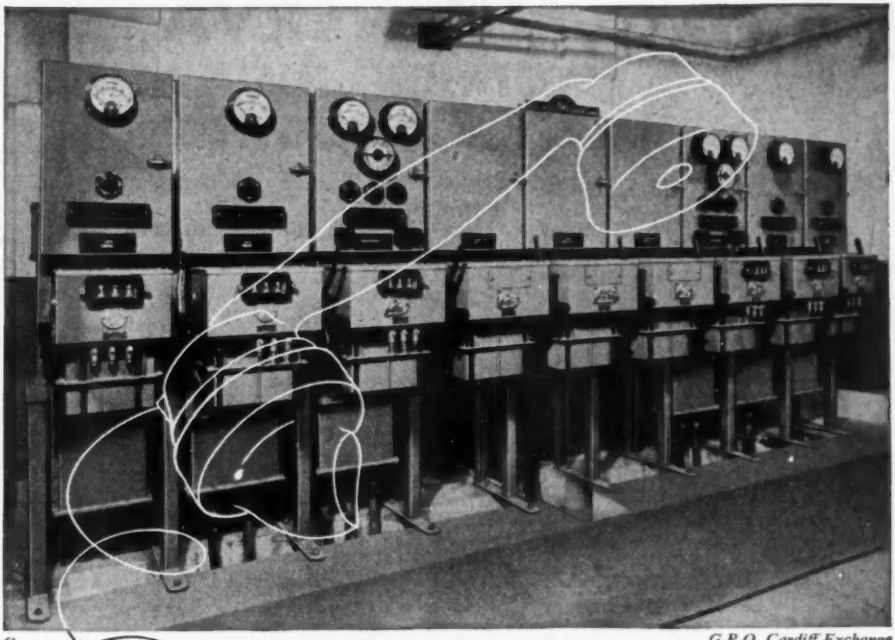

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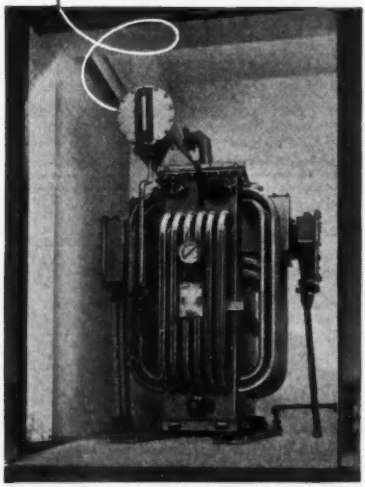

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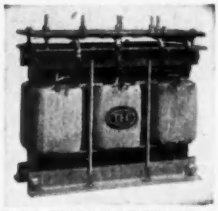

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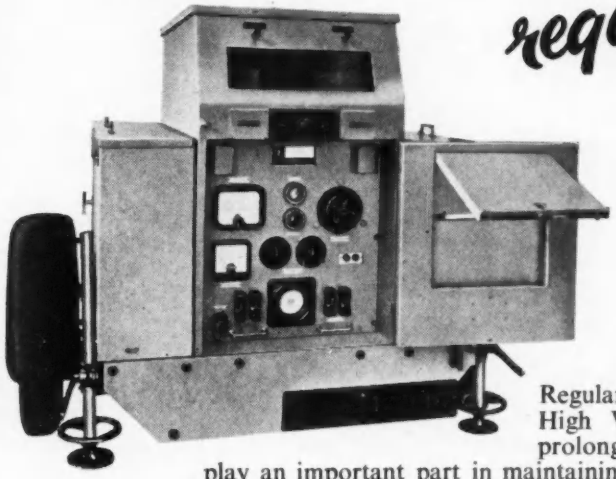

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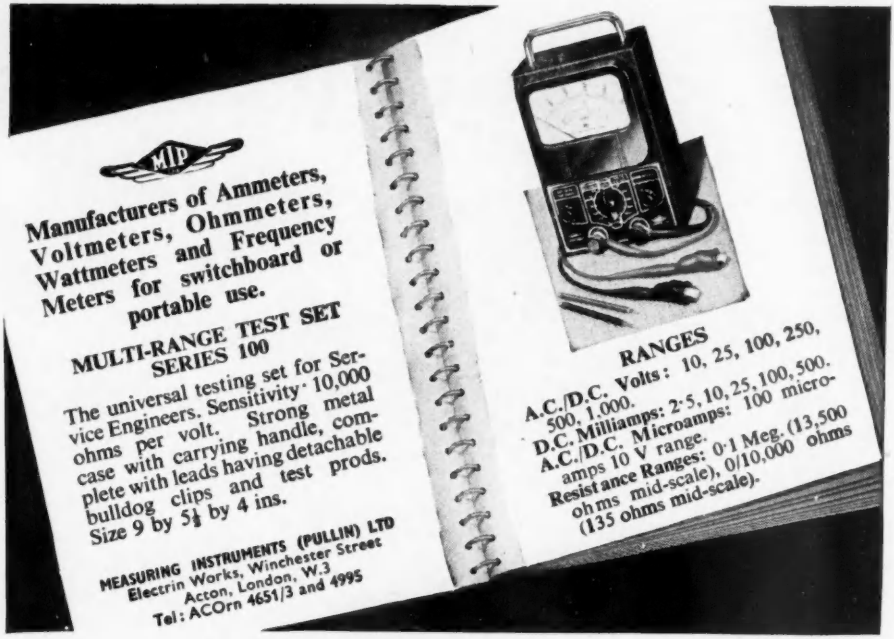
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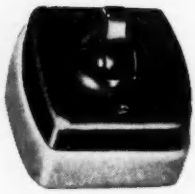
JUST  ONE

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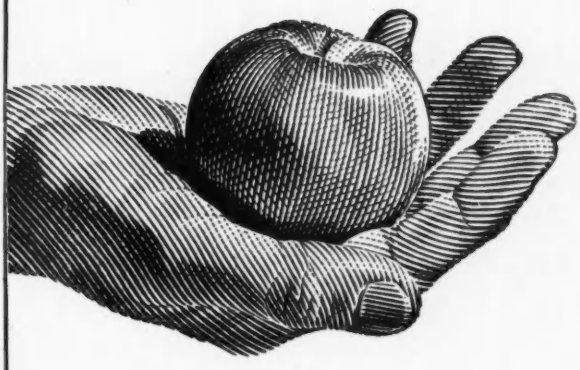

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✷

What are the only French possessions in North America?

✷

Where do they export Carobs?

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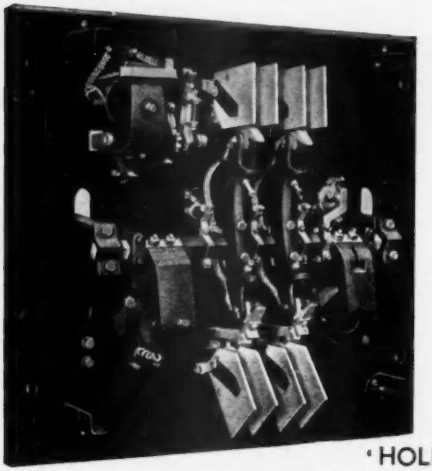

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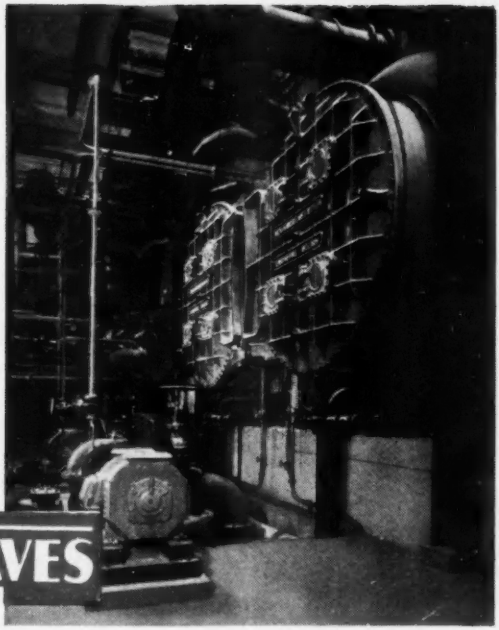

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